JUNE
24
1960

PETROLEUM WEEK

A McGRAW-HILL PUBLICATION

Producers differ on waterflood curbs 23

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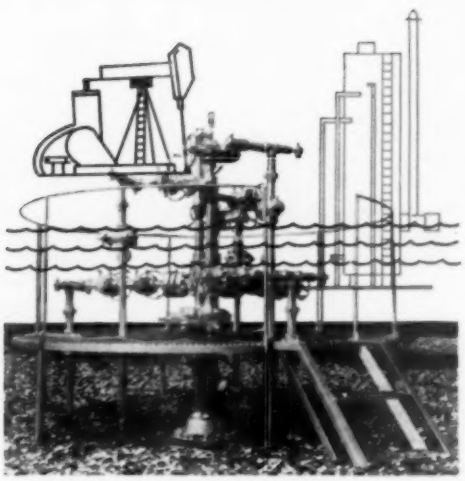

An evolution in production is placing greater emphasis on natural gas, secondary recovery, multiple (left) and tubingless completions, and unit ventures 48

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Price 50 Cents

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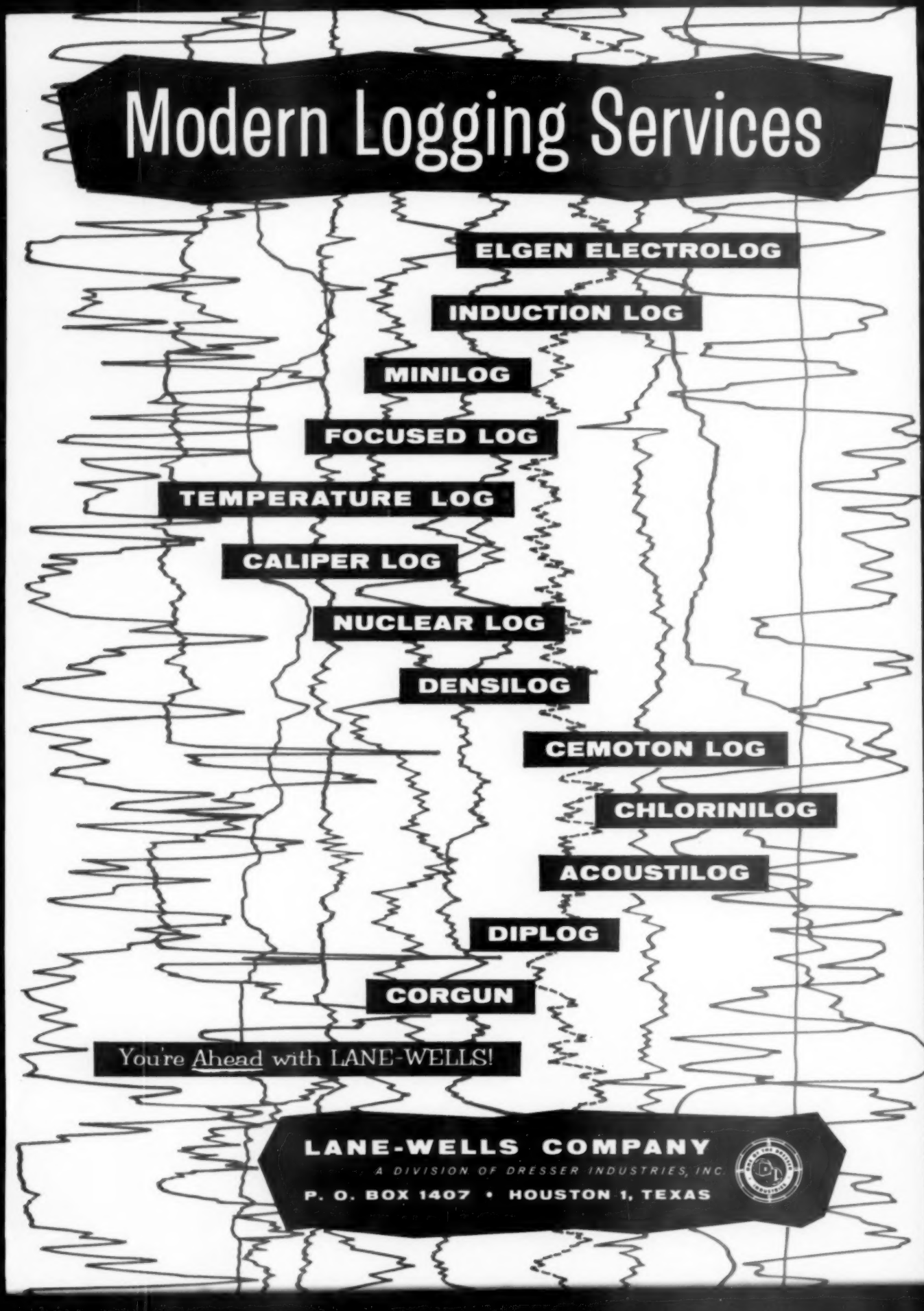
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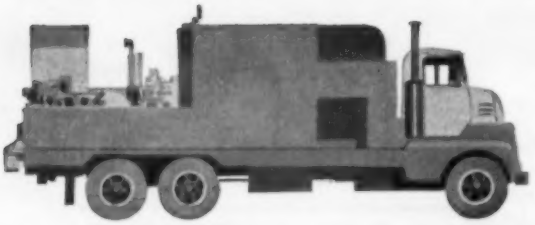

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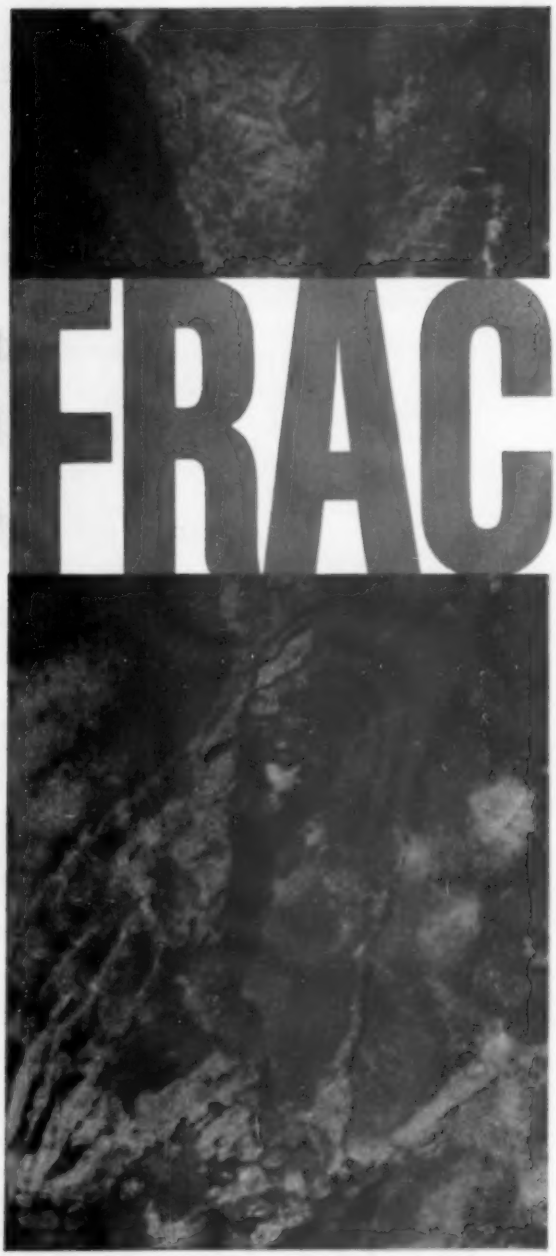

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INSIDE Slant

JOBS NEEDED, TOO

There is considerable agitation to encourage more students to study engineering in the nation's colleges and universities.

This is well and good in the fight to reach technological supremacy in science and engineering.

But one important point is being overlooked: employment after the student graduates. This is particularly true of geologists and engineers in the petroleum industry.

There probably are more unemployed persons in these sciences than in any other category in the industry.

And the effect is being reflected by a downward trend of such graduates from the University of Texas.

Only recently, John Hurd, president of the Texas Independent Producers & Royalty Owners Assn., quoted these figures:

Engineer graduates dropped from 120 in 1957-58 to 115 in 1958-59 and to 90 in 1959-60.

Graduate placement in the petroleum industry is continuously more difficult, with many graduates having to go into other fields than that for which they were educated.

Only the exceptional engineer or geologist today is finding employment readily available.

LeRoy Menzing

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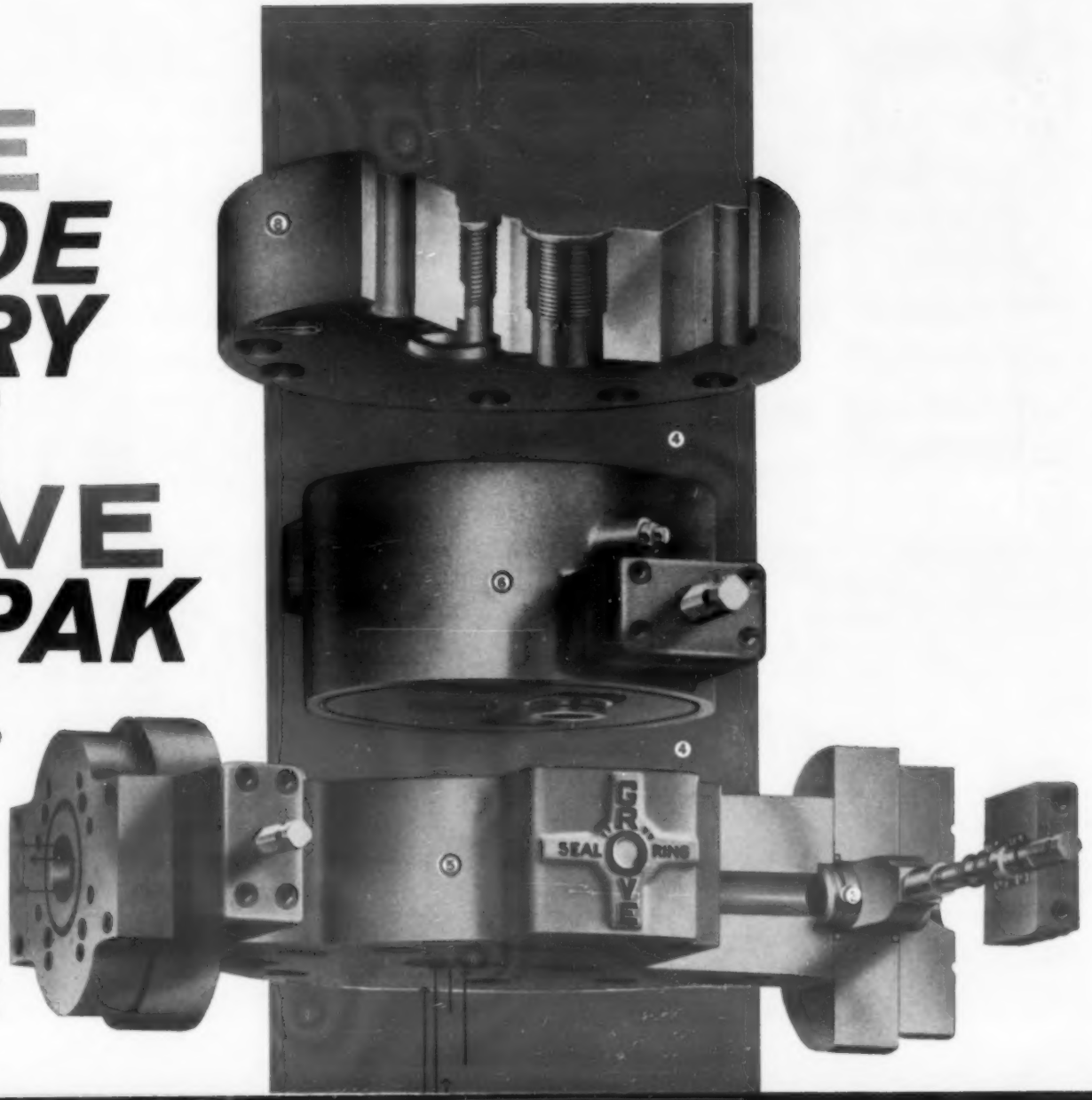

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DEPT/Opinions

Views That Make News . . .

"Technological progress doesn't necessarily mean social progress. The Russians have hit the moon, but they haven't reached self-government."

—L. F. McCollum
President
Continental Oil Co.

. . . and Letters

Dear Sir:

Thank you for your editorial "Can't We Whistle While We Work?" [PW—Jun.3'60,p60].

The face that the oil industry shows should not be one of gloom, but one of firm faith in the future. True, it hurts when you have a tummyache, but have you eased the pain by transmitting your woes to others? Woudn't it be much better to whistle with an air of confidence and practice positive thinking to dispel the ominous clouds of pessimism?

Bill Connor
Duncan, Okla.

Dear Sir:

Your article "What Causes Olefins in Exhaust Gases?" [PW—May27'60, p40] is an excellent example of your magazine's interpretive analysis of research studies which occur within the industry.

The problems of the correlations between fuel and exhaust compositions is one which we in the industry have been studying for some time. As your article points out, findings indicate that Los Angeles' anti-olefin Rule 63 is not likely to achieve its purpose. Your article gives readers a comprehensive review of what has been accomplished so far regarding our continuous research on fuel components. Congratulations on a fine piece of reporting.

Felix Chappellet
Vice-president, general manager
Western Oil & Gas Assn.

Dear Sir:

I have just graduated from college with a B.S. in math, minors and electives in geology and physics. Before I can go into graduate work, I have to make up some courses which I'll be doing at Texas A & M this summer. Without financial assistance, I won't be able to go on to higher schooling, and most scholarships are already given out for 1961. I have all A's and B's on my transcript, have served four years with Uncle Sam, am single, etc. —seemingly all the requisites. But when a student of geophysics tries to get a sponsor for graduate school through an oil company, he runs into a wall.

Some are changing their majors to nontechnical fields, some are giving up completely and going into car sales, insurance, etc. What of this saying that "the United States needs more men in science, in technical fields, and with the desire to further their education?" How can we when there's evidently such a lack of money for education in this field alone?

Garry Henderson
Alpine, Tex.

Dear Sir:

You quoted a cumulative production figure of 790-trillion cu. ft. of gas [PW—Jun.3'60,p10]. I wonder if this might be an error in decimal places; if not, would you refer me to your source of information?

I would like to take this opportunity to say how much I have enjoyed reading your magazine; especially the editorials, in which you have so aptly expressed the views of many people including myself.

Donald D. Whitaker
Geological supervisor
Texas Gas Transmission Corp.

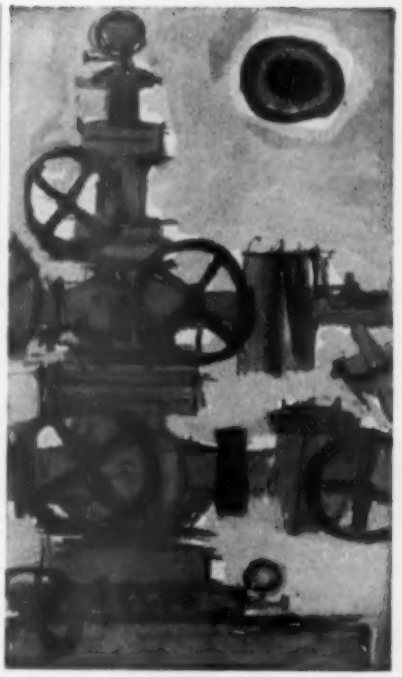
• Reader Whitaker did find an error in decimal places. The figure should have read 790-billion cu. ft.

Dear Sir:

I was very interested in reading your report "Sunray Makes First Sextuple Completion" [PW—May27'60, p24]. This is indeed a feat which points to more economical oil production ahead.

Although the directional perforating on this well was done by our crews out of Wharton, Tex., the Schlumberger management in Houston learned of the completion in the same way your other readers did—via the press. This is not to say that the operations were routine; no oriented perforating jobs can be so considered. However, the conditions were straightforward, and did not present engineering problems beyond those handled daily by our specialized oriented perforating crews.

Oriented perforating, introduced approximately one year ago by Schlumberger, has been a continuing problem-and-solution effort on the part of



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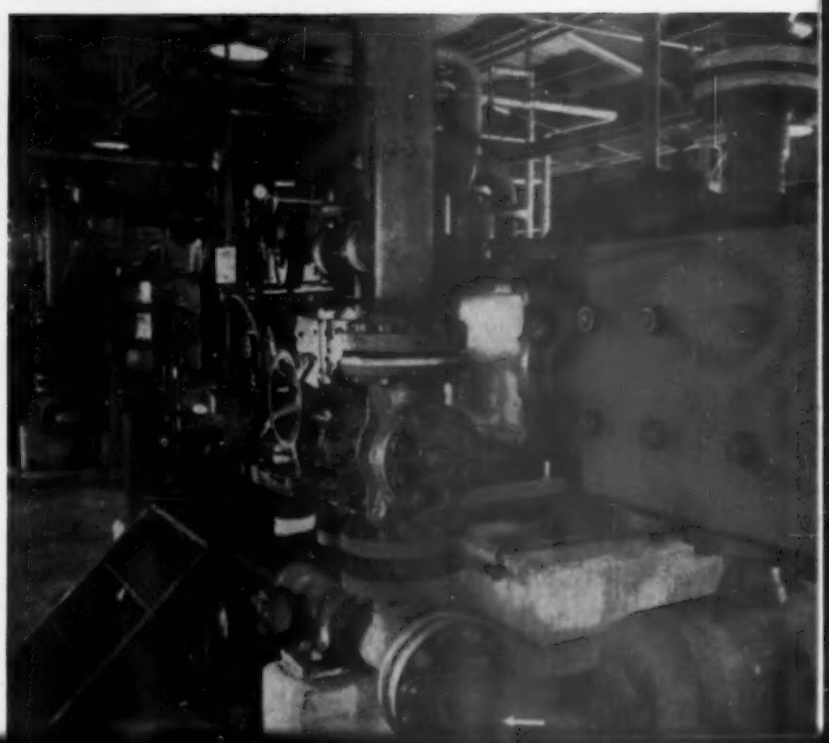

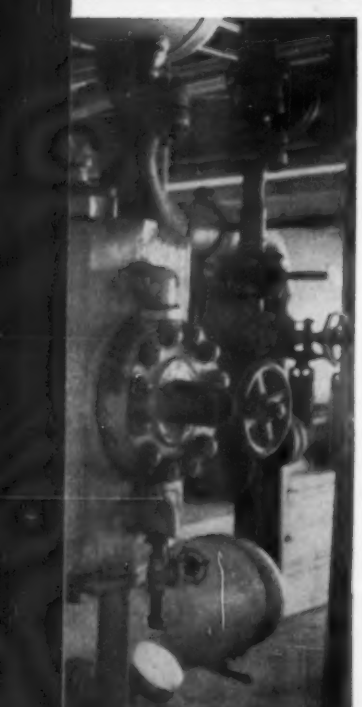

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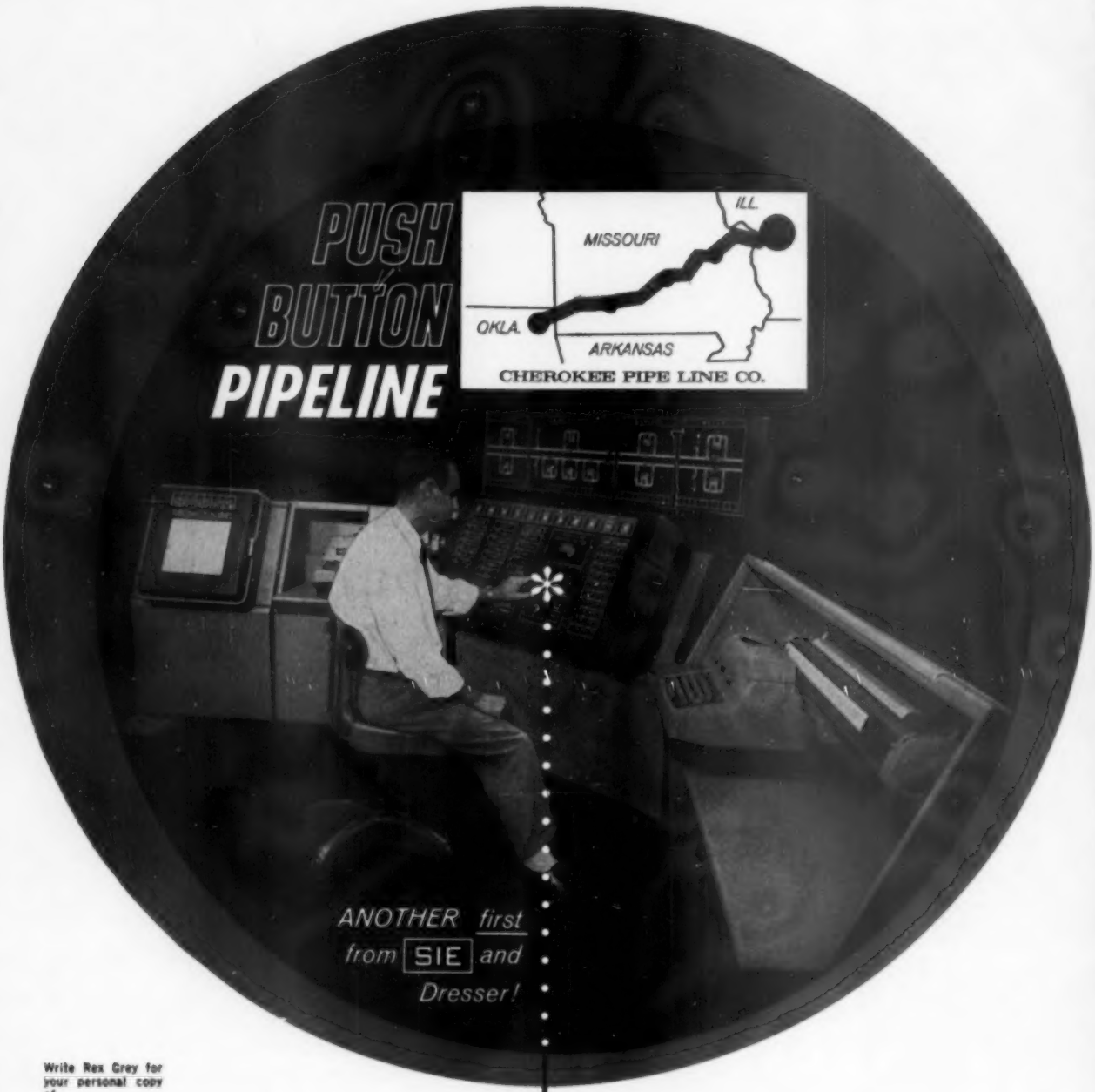

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(1) Perforation of a quadruple completion in which three strings of 2⅜-in. casing were set through 8⅝-in. casing and cemented in 7⅞-in. hole below. One zone was completed through each of the three slim casings. The fourth zone produces through perforations made in the 8⅝-in. string prior to running the small strings, and flows through one-inch tubing run parallel to the 2⅜-in. casing strings.

(2) Perforation of a triple tubingless completion, below 9,000 ft., in which three 2⅜-in. casings were run into a sidetracked hole through a window in 7-in. casing. This well was reclaimed most economically by the multiple tubingless completion method, after mechanical difficulties caused abandonment of a conventional triple-completion operation in the original hole.

(3) Reperforation of one string of a quadruple tubingless completion without interruption of production through the other three strings.

(4) Reperforation of 7-in. casing below the shorter of two paralleled 2-in. tubing strings of a dual completion without penetrating or damaging the longer tubing string. The tubing strings were bottomed in packers above their respective producing zones. The oriented perforating of the casing between the packers, at a depth of 10,900 ft., was accomplished without stopping production of the lower zone.

ROBERT R. RIEKE
General sales manager
Schlumberger Well Surveying Corp.

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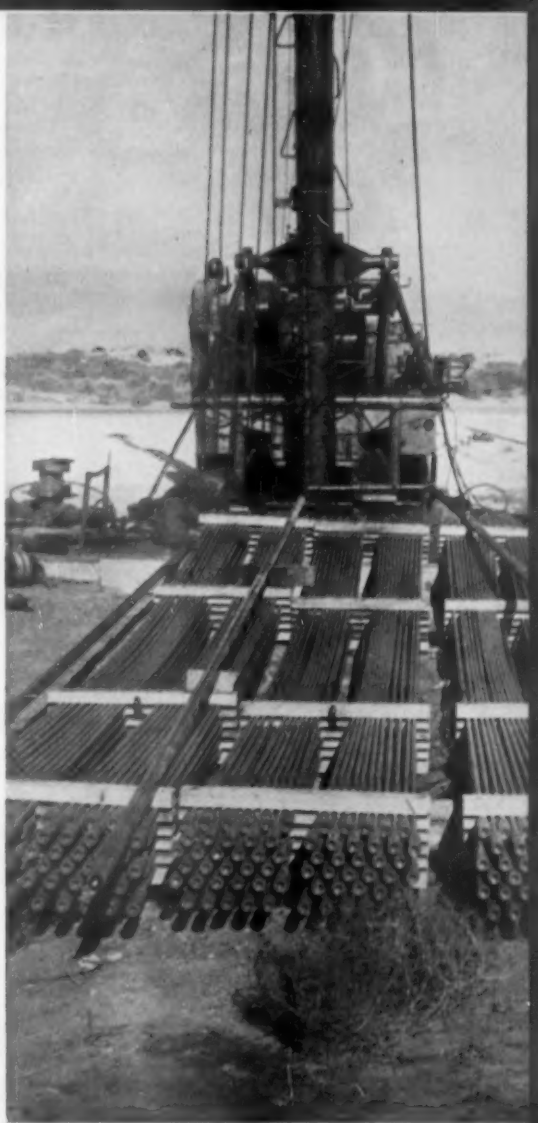

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June 24, 1960

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Producers are placing more emphasis on natural gas and secondary recovery in their efforts to control costs. A special report also shows the growing use of multiple and tubingless completions and a swing to joint producing ventures. . . . p. 48

•

Canadian operators are out to find better ways to produce and process sour gas. They've been spurred on by the increasing demand for gas since export plans to the U.S. have been approved. . . . p. 35

•

Texas producers generally favor limiting production from waterflood and pressure maintenance projects through unit allowables. There are sharp differences over the methods of control, ranging from assigning permissibles based on reserves and injection rates to special incentives. . . . p. 23

•

Italy's state-owned ENI is carving out a bigger chunk of the African market. Its president, Enrico Mattei, has now lined up interests in 11 countries. . . . p. 104

•

A new highway-interchange design is winning hurrahs from oil marketers in Ohio. The diamond-wishbone design will permit construction of competitive stations along the roads. . . . p. 88

•

World geophysical activity dropped again in 1959—down 8.9% from 1958. According to a report issued this week, all major areas of the free world showed a decline, except the Far East. Canada posted the biggest drop—25.6%. . . . p. 40

•

The outlook for the refining and petrochemical business south of the border is sunny. That's the forecast of U.S. and Latin American engineers meeting in Mexico City this week. . . . p. 84

•

"Fill 'er up and no stamps," may become the customers' plea in California, where a trading stamp ruling could stir a price turmoil. A ruling by the attorney general could cause dealers to post two prices: one with and one without stamps. . . . p. 88

•

Large-volume processes are best suited to computer control. The manager of the process analysis department of an electronics firm takes a look into the future. . . . p. 83

•

Venezuela has stepped into the turmoil over refining Soviet oil in Cuba. It has warned the Cubans they may have trouble getting Venezuelan crude in the future if they diminish purchases now. . . . p. 107

Up to the Minute

SIGNIFICANT LATE NEWS

June 24, 1960

The U.S. Supreme Court apparently sided with the Federal Trade Commission against "local" price cuts this week. It returned the Anheuser-Busch "price discrimination" case (PW—Jun.10'60,p12) to the Seventh Circuit Court of Appeals without deciding the main point involved. The appeals court, ruling against FTC, held that the company could reduce its prices of nationally advertised beers in one area in competition against local beers.

•

The petroleum industry won—and lost—in the Senate's 1960 effort to reduce the depletion percentage permitted oil and gas producers. The victory was in the 56-30 defeat of an amendment by Illinois Democrat Paul Douglas to an excise tax extension bill that would have graduated the percentage downward to 15%.

The loss was in the strength of the antidepletion group, particularly among oil-state senators. This year's 30 votes to cut the percentage was a gain of nine over 1959, but one below 1958. Thirteen oil-state senators voted for the Douglas amendment: John Carroll (D., Colo.), Joseph Clark (D., Pa.), Paul Douglas, Albert Gore (D., Tenn.), Philip Hart (D., Mich.), Jacob Javits (R., N. Y.), Kenneth Keating (R., N. Y.), Frank Lausche (D., Ohio), Pat McNamara (D., Mich.), Frank Moss (D., Utah), George Smathers (D., Fla.), Stuart Symington (D., Mo.), and Stephen Young (D., Ohio).

Eight oil-state senators did not vote on the depletion issue. They were: James Eastland (D., Miss.), Barry Goldwater (R., Ariz.), Vance Hartke (D., Ind.), Thomas Hennings (D., Mo.), Estes Kefauver (D., Tenn.), James Murray (D., Mont.), Joseph O'Mahoney (D., Wyo.), and John Sparkman (D., Ala.).

The Senate's over-all tax bill will keep the corporate income tax rate at 52% for at least another year. It voted against ending taxes on telephones, and transportation.

•

Oklahoma's conservation director favors suspending discovery allowables and keeping a closer check on exempt production. Massena B. Murray recommended that the 150 b/d discovery allowable be suspended for three months and that the Corporation Commission take a look at waterfloods and other unallocated wells which are "taking more than their fair share of the market."

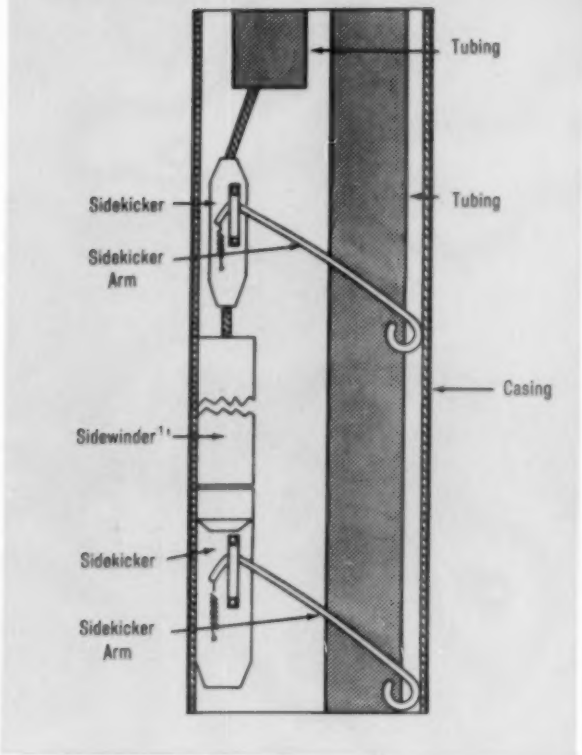
•

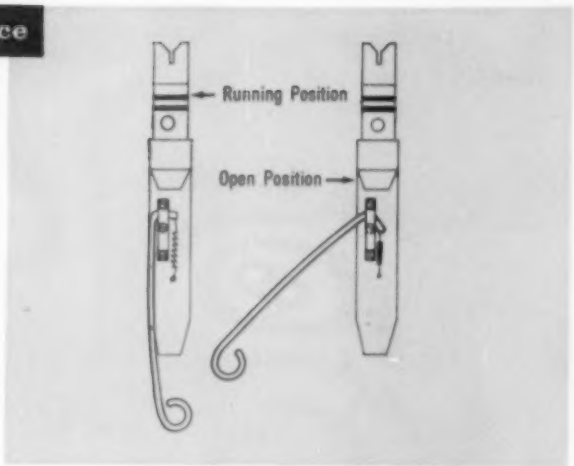
Reports in Washington this week were that Aristotle Onassis may be asked to transport Russian crude to Cuba. Should Cuba and Russia find sufficient tankers to supply the nation with Russian crude, the speculation is that Fidel Castro could then carry through his threat to take over the three foreign-owned refineries.

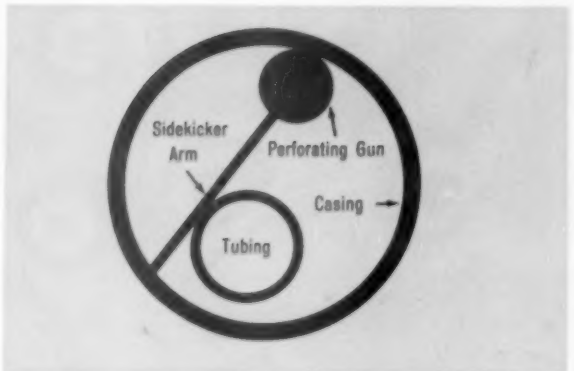
•

Ohio Oil Co. is the latest to reduce Illinois Basin crude prices. It met the 15¢-a-bbl. cut initiated by Ashland Oil & Refining Co. in all fields where it buys in eastern Illinois and western Indiana.

Revolutionary New Completion Service







Sidekicker Solves Dual PWC* Problems

*** Permanent Well Completions**

Welex engineers have answered the problem of perforating an upper zone with no risk to the adjacent tubing string in dual permanent well completions. The new development — another first by Welex — offers these advantages:

- Service can be performed through 2" tubing and standard seating nipples.
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- The Sidekicker positions jet gun so that the charges will fire outward through the casing — never in the direction of the adjacent tubing string.
- Sidewinder[1] retrievable carrier absorbs the shock of detonation, protecting adjacent tubing string from damage.
- Absolutely no debris is left in the hole. All debris is retained in the carrier and returned to the surface.

Welex, the company that originated jet perforating proudly adds this new service to the other "firsts" that it has introduced to the oil industry.

In Permanent Well Completions, as well as in other types of completions, Welex has a complete set of tools for every job. Next time and every time let Welex's completion services work for you.

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General Offices: 1400 East Berry, Fort Worth, Texas
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[1]Trademark of Jet Research Center, Inc.

ANOTHER CASE OF
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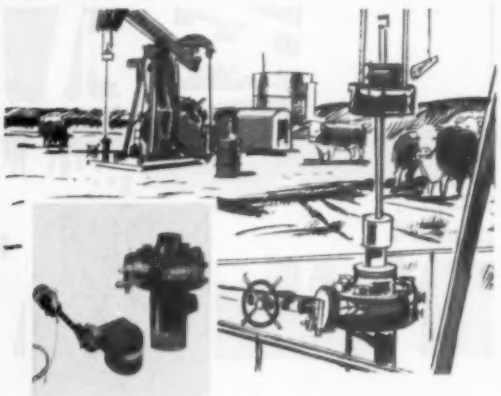
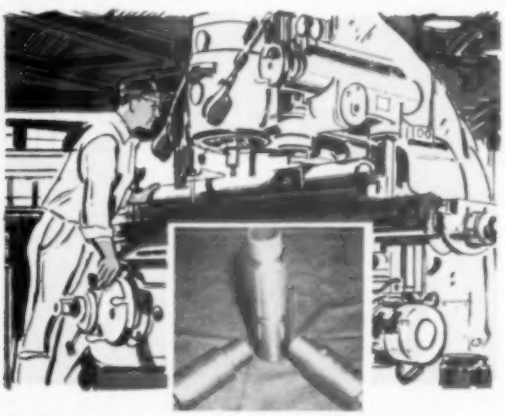
"Only experience guarantees quality in manufacturing... and HOMCO has it!"



Homco Ace-O-Matic Rod and Tubing Revolvers are effective, economical methods of extending the life of rods and tubing on pumping wells. Compact (body diameter: 5-ins. OD) Homco Ace-O-Matic Revolvers fit most carrier bars. Rod revolver is easily installed at any time. Tubing revolver may be installed before tubing is in place or when tubing is pulled for well workover. In addition to giving extra life to the polish rod, rod revolver helps control paraffin. For added safety, tubing revolver has all the necessary pressure control features of a tubing hanger.



Homco Tubing Tool Joints convert tubing to workover strings and protect the tubing string against crushing action of tongs. Designed for fast make-up and break-out, Homco Tubing Tool Joints take all the wear and eliminate the danger of galling regular tubing threads. Machined from heat-treated S.A.E. 4140 steel, Homco Tool Joints are shipped in skidded steel cases to prevent damage. Joints are available as tool joint or coupling type.

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These proven products from the oil industry's most complete manufacturing and service organization guarantee you top quality tool performance.

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Tubing Tool Joints
Type "E" Packers
Jet Bypass Valves
Precision Built Steel Subs

Homco Type "E" Packers are ideally suited for high pressure, high temperature completions. Constructed of heat-treated S.A.E. 4142 steel, these packers can be set with a considerable amount of weight which assures that packer will not become dislodged due to high pressure differentials and further insures that a positive seal is maintained. Incorporated in the packer is an automatic bottom which requires 7 to 8 turns to disengage, but may be re-engaged by simply raising the tubing string. This feature means that packer cannot disengage while going in the hole and cause premature setting.

Homco Precision Built Steel Subs are manufactured of high grade, heat-treated alloy steel. Homco Subs are manufactured, machine finished, accurately threaded and gauged to individual requirements to give you the highest quality drilling equipment you can buy. Homco Subs have uniform strength and rigid ruggedness, and are magnaflux inspected to assure that all materials meet Homco's high quality standards. These tools are available as Reducing Subs, Drill Collar Subs, and Drain Subs.

Homco Jet Bypass Valves are used with jet type drill bits to provide auxiliary openings in the drilling assembly above the bit. The valve permits normal fill of pipe while running in the hole thereby reducing the possibility of damage to lost circulation zones because of pressure surges. Valve remains in closed position when circulating and directs all the drilling fluid through the bit. When drilling assembly is retrieved, valve is in open position permitting pipe to drain, thus the swabbing effect of the bit is reduced as it is retracted, and the necessity of pulling wet strings of pipe is eliminated.

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PROUD TO BE PART OF A PIONEERING INDUSTRY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PETROLEUM WEEK
June 24, 1960

Texans Favor Waterflood Controls

But producers differ sharply on the methods to curb production from future floods and pressure maintenance projects. Generally, unit allowables with maximum flexibility for operators are proposed.

Texas producers generally favor some restrictions on waterfloods and pressure maintenance projects.

That was the consensus of last week's two-day hearing before the Texas Railroad Commission to determine whether future waterfloods and pressure maintenance projects should be subject to proration.

Any plan that may be decided on will not affect existing projects.

At the close of the hearing, Commission Chairman Ernest O. Thompson said that interested parties could file additional data up to July 1.

On one point, there was virtual unanimity—that such projects be given unit allowables to encourage greater efficiency.

The preponderance of opinion favored granting allowables to all wells within a project, injection and producing alike. The total of these allowables would be the over-all project allowable.

The operator then would be free to produce as many or as few of the wells as he wished.

This flexibility would encourage orderly and efficient flushing of reservoirs.

Some felt that a continuation of present commission policy, with only a minimum of incentive, would be sufficient.

Specific recommendations differed widely. There was a hot exchange over subjecting such projects to shutdown days. Humble Oil & Refining Co., Atlantic Refining Co., and others urged shutdowns.

W. J. Greenwald, Humble's chief reservoir engineer, argued that there is no difference between waterfloods and pressure maintenance programs in this respect, and said neither would be affected adversely by shutdown days.

He was supported by Dr. Claude Hocott, research manager of Humble's production department, who declared:

- A curtailment of the rate of injection "will not cause physical waste or loss of recoverable oil" in a reservoir.
- Any "imbalance" occurring in pattern waterflooding "is a question of pressure control" and not "rate control, as such."

In fact, said Hocott, recovery in an unconfined flood actually is higher with a low injection pressure than with a high injection pressure.

Howard A. Koch, Atlantic's senior staff reservoir engineer in charge of secondary recovery, contended that the two most important factors in flushing out additional oil are reservoir wettability and the stage of depletion—and that in a uniform reservoir system, at least, the injection rate has no substantial effect.

The net substance of this position was a recommendation that the commission subject waterflood and pressure maintenance programs to the same shutdown-day requirement imposed on all proratable Texas wells.

But there was a vigorous attack on shutdowns, led by Union Oil Co. of California and Phillips Petroleum Co.

Union threw up an imposing array of charts, testimony, and even a movie, detailed by Sam A. Snyder, its attorney, and Dr. C. R. McEwen, of its research staff, to demonstrate that waterfloods are "sensitive" to the rate of injection.

Jack Tarner, technical adviser to Phillips' vice-president of production, offered several Kansas and Oklahoma fields as examples to illustrate his argument that "restrictions"—interruption of injection—definitely causes oil to be "lost" in the reservoir.

Atlantic Refining recommended that injection project allowables be tied directly to the amount of increased reserves developed.

J. W. Stayton, Atlantic attorney, called for immediate action before the problem gets out of hand.

Howard A. Koch, senior staff reservoir engineer in charge of secondary recovery operations, said some 5-billion bbl. of oil to meet Texas demand in the next ten years will have to come from secondary recovery.

John E. Garrett, Atlantic's senior reservoir engineer in charge of proration, proposed that: (1) the commission allocate scheduled production to injection programs on the basis of additional reserves made available by them; (2) such allowables not be less than permitted by a yardstick or other formula; and (3) this "reserves allowable" be granted when the additional reserves are developed or made available.

Garrett presented a tabular method of calculating the additional allocation.

Based on the total Texas reserves as of Dec. 31, 1959, and the 1959 daily producing rate, Garrett came up with an "allowable constant" that could be used for fluid injection projects—513 bbl. of oil per producing day for each 1-million bbl. of reserves.

The West Central Texas Oil & Gas Assn. proposed using the 1947 yardstick, with incentives.

The group's president, Sam L. Robertson, and the head of its engineering and conservation committee, James E. Russell, both of Abilene, proposed an incentive ceiling of 100% of the 1947 yardstick, with a minimum allowable level, for strictly waterflood projects.

For pressure maintenance programs, the association recommended an incentive not to exceed 125% of the yardstick.

Texaco Inc. proposed a system that would include the accumulation of "injection credits."

The productive capacity of the project would be a determining factor in fixing the project allowable under several alternatives.

The commission could administratively assign an allowable equal to the top exempt allowable, the top county regular allowable, or the top marginal allowable—times the number of producing and injection wells—with an exemption from shutdown days.

Or the allowable could be granted on the basis of the 1947 yardstick, subject to shutdown days.

In addition, the operator could earn an "injection allowable" at the rate of

0.2 bbl. of oil for each equivalent reservoir bbl. of injection fluid, not to exceed 50% of the base allowable granted the project.

This earned credit would be figured monthly and could be cumulative.

The Texas Conservation Group, formed especially to recommend a proration course for injection projects, took something of a middle course.

The group of some 125 independents and integrated companies presented these suggestions:

- Stripper well waterfloods and pressure maintenance programs require the project allowable treatment, and an additional incentive allowable on pressure maintenance programs may help get them started earlier.
- The operator should be able to determine in advance what his allowable treatment will be, to a reasonable degree, so he can plan and finance his injection program accordingly.
- In addition to a project allowable, there should be an "injection allowable," determined by a flexible "injection index" and exempt from shutdown days.

Mobil Oil Co. proposed that Texas abandon the MER system as a basis for proration.

Jack Vickrey, Mobil's representative, said the commission went to the MER system during an emergency period.

Because of the present low number of producing days, he advocated applying the 1947 yardstick to all prorata-ble wells in the state.

Such a plan, he said, would permit every prorated well to have one additional producing day each month on a ten-day schedule.

This would have meant 135 days in 1959, rather than 123 days, he added.

Mobil charged that many of the "high-MER fields" couldn't make their allowables on a 30-day schedule.

Testifying for Mobil, Jack K. Baumel, former commission chief engineer, said that 2.7% of the fields receive 16% of the scheduled allowable.

He said that 153 of the 6,906 fields had MER allowables in excess of the 1947 yardstick, with their scheduled allowables totaling 33,686 b/d on an eight-day basis.

Of these, he said, ten fields receive a scheduled allowable of 479,385 b/d on an MER basis, compared to the 245,019 b/d under the yardstick formula, both based on eight producing days.

Baumel contended that the "high-MER fields" have "always gotten the cream" of Texas' market demand.

Intangible Change Fought

Oil and gas producer groups are asking the Internal Revenue Service to cancel a proposed change in the tax treatment of intangible drilling and development costs for operators who don't take part in a well's complete "pay-out" period.

A revised version of Internal Revenue regulations on intangible costs would, for the most part, limit any change to that operator—one who gives up his rights before the full pay-out.

Producer lawyers believe the proposed regulation, if adopted, would have little or no effect on tax payment by operators who hold rights throughout the period.

Some oil and gas tax attorneys welcome the effort for a new set of rules, although they quarrel particularly with the treatment of the less-than-full-period operator.

Present government regulations are based on the 1939 tax code, which generally has been interpreted by federal tax men as allowing all operators to make their one-time choice of either reporting intangible costs as a business expense, or capitalizing them. The amount an operator could claim usually depended only on his percentage right in the well.

But some conflicting court decisions have muddled the tax air sufficiently to make rewriting the regulations desirable, many tax lawyers think. Others, however, point to Congress' 1954 tax code action—telling Internal Revenue simply to adopt the 1939 regulations on intangible costs.

This group fears the tax agency's latest ideas may be in conflict with Congress' intent.

Internal Revenue tried in 1956 to write new regulations, but gave up the attempt as a bad job after hearings stirred strong opposition.

The new proposals would allow a short-period operator to expense intangible costs only for that percentage of rights he held immediately after pay-out.

Producer lawyers argue that an operator might hold 50% of a well's rights during the early part of the pay-out period, but have his rights contractually reduced to 25% or 10% by the end of the period.

Thus, they say, it would be inequitable to determine his ownership share—and thus his right to treat as expenses the intangible costs—by using only the percentage figure at the period's close.

These critics also point out that such a rule might prove unworkable, that a contract could be written allowing an operator's share to soar upward at the end of the pay-out period, although his share might have been lower at an earlier point.

Can Venezuela Find Own Outlets?

Venezuela's Oil Minister is in a tight corner on the question of how the new government oil company would sell its crude in today's buyers' market. The question is speculative, since the company, formally set up this spring as Venezuelan Petroleum Corp., hasn't even started drilling. But if it finds oil on its acreage in Lake Maracaibo, the government company will find itself in the same boat as the "independents": They have oil, but no ready outlet.

Discount sales could be one answer, but Oil Minister Juan Perez Alfonzo has repeatedly opposed discounting Venezuelan oil.

He has argued that prices should be held up, and that no more oil should be pushed into world markets than can be absorbed without a price break.

Discount sales would also undermine his position with Middle East countries, whose cooperation he is trying to get to maintain prices by some system of world production controls.

Perez doesn't like barter deals either. He is against exchanging Venezuelan oil for consumer goods on the ground that oil is too valuable as a resource to be traded on the same basis as such "renewable" commodities as coffee or sugar.

And, as Perez himself pointed out to Venezuelan business groups recently, most countries that want barter deals on oil cannot provide the goods that Venezuela needs.

All this adds fuel to the speculation that the Oil Minister might try to get the national company's crude marketed by the major oil companies that have their own market outlets.

Unless he offers attractive inducements, however, it's expected that the companies' response would be distinctly short of enthusiastic.

Texas Allowable Cut Means Lower Runs

Indications now are that the producing days in Texas for all of 1960 will total less than the low of 122 days of 1958.

The Railroad Commission this week ordered another eight-day schedule for next month, the third consecutive eight-day limit. It matches the three eight-day months in the second quarter of 1958.

In all of 1958, 122 producing days were permitted, one less than in 1959. In the first half of 1960, 55 producing days were scheduled, compared with 56 in 1958. But in that year, nine days were permitted in July and no less than 11 days were scheduled for the remaining months of the year.

The outlook for producing days for the rest of 1960 isn't anywhere near that optimistic.

The initial July crude allowable was set at 2,596,609 b/d, a reduction of 47,078 b/d from the June 18 level. Most purchasers and several producer representatives recommended such a reduction.

Indiana Oil Purchasing requested only seven days for July, noting that it would have 16,000 b/d of Texas crude to sell on eight-day schedule.

Commission Chairman Ernest O. Thompson estimated that production from new wells in July would offset the reduction from the June allowable.

Oil economists predict that the eight-day schedule for July will bring a reduction in refinery runs, which will give further strength to prices—particularly of gasoline.

Estimates are that runs next month will average about 7,750,000 b/d, the lowest for any month since last October when they were 7,650,000 b/d.

June runs are expected to average close to 7.9-million b/d.

U.S. Firms Say Japan Is Unfair

U.S. oil men are worried over the possibility of being squeezed out of the booming Japanese oil market.

At least two oil companies have appealed to the U.S. embassy in Tokyo to take a stand against what they feel is unfair treatment of American oil importers.

They feel the Japanese government's recent "low" price tag on Idemitsu Kosan's oil imports from Russia will let that company grow all out of proportion to other operators.

Idemitsu has unofficially obtained a ruling from the Ministry of International Trade & Industry (Miti) that its Russian crude is accredited at 96.5¢ a bbl., f.o.b. Black Sea ports.

Foreign exchange allocations for oil imports are a main basis of competition in the Japanese market. The lower the price assigned by the government's Miti, the more barrels an importer is able to bring into the country.

Thus, Idemitsu, with a preferred position, is seen as swamping the competition and assuming the position of Japan's No. 1 company.

The industry claims the low price assigned to the Russian oil is far below prices charged by the Russians to French and Italian buyers.

But Miti says that it can only work from Idemitsu's landed price of $15 a ton, and therefore has to accept Idemitsu's freight figures to get an f.o.b. price.

Bureau of Mines Sees 1960 Demand Up 3.5%

Bureau of Mines economists now figure that total demand will grow 336,000 b/d during 1960, tempering its earlier forecasts by 82,000 b/d.

Revised estimates place total demand for the year at 9,998,000 b/d, a gain of 3.5% over 1959. This is pretty much in line with recent forecasts by top oil company economists (PW—Jun.17'60,p27).

The slight revision is due mostly to a reappraisal of the market for gasoline, distillates, and products in the "all other" category.

Reduced runs and stock drawdowns will hold total new supply at about 1.5% above 1959 levels, the bureau estimates.

Imports will remain unchanged from a year ago. Domestic production will increase an estimated 1.8%.

(Thousands of b/d)

	1st Quar.	% Chg. from 1959	2nd Quar.[1]	% Chg. from 1959	3rd Quar.[2]	% Chg. from 1959	4th Quar.[2]	% Chg. from 1959	Full Year[2]	% Chg. from 1959
U.S. output	**8,153**	**+ 0.9%**	**7,825**	**— 2.8%**	**8,070**	**+ 5.4%**	**8,265**	**+ 4.8%**	**8,079**	**+ 1.8%**
Crude	7,199	...	6,925	— 3.6	7,180	+ 5.6	7,325	+ 4.2	7,158	+ 1.5
Gas liquids	954	+ 0.5	900	+ 4.0	890	+ 4.8	940	+ 2.6	921	+ 4.8
Imports	**1,953**	**—12.2**	**1,681**	**+ 5.2**	**1,583**	**+ 3.2**	**1,900**	**+ 6.9**	**1,779**	**— 0.1**
Crude	990	+ 3.3	1,020	+ 6.0	960	+ 1.6	995	— 0.1	984	+ 2.0
Products	963	—23.9	661	+ 3.9	623	+ 5.8	905	+15.9	795	— 2.5
New supply	**10,106**	**— 1.9**	**9,506**	**— 1.5**	**9,653**	**+ 5.0**	**10,165**	**+ 4.6**	**9,858**	**+ 1.5**
Total demand	**10,801**	**+ 1.5**	**9,313**	**+ 3.3**	**9,390**	**+ 4.1**	**10,490**	**+ 5.0**	**9,998**	**+ 3.5**
Gasoline	3,778	+ 0.5	4,445	+ 3.3	4,500	+ 2.1	4,180	+ 5.2	4,226	+ 2.8
Kerosine[3]	493	+ 5.8	202	+24.7	242	+20.4	433	+11.0	325	+ 6.9
Distillate	2,738	+ 2.5	1,405	+ 2.4	1,260	+ 3.6	2,260	+ 6.2	1,915	+ 3.9
Residual	2,014	— 3.5	1,452	+ 1.3	1,361	+ 9.6	1,720	+ 3.9	1,637	+ 2.1
All other[3]	1,778	+ 7.1	1,809	+ 3.5	2,027	+ 3.8	1,897	+ 3.0	1,895	+ 5.2
Domestic demand	**10,599**	**+ 1.7**	**9,104**	**+ 3.5**	**9,190**	**+ 4.2**	**10,290**	**+ 5.0**	**9,796**	**+ 3.7**
Gasoline	3,744	+ 0.7	4,400	+ 3.5	4,450	+ 2.0	4,135	+ 5.2	4,183	+ 2.9
Kerosine[3]	490	+ 5.6	200	+24.2	240	+21.2	430	+11.7	340	+13.0
Distillate	2,708	+ 2.9	1,370	+ 2.4	1,225	+ 3.9	2,220	+ 5.7	1,880	+ 3.9
Residual	1,957	— 2.6	1,397	+ 1.9	1,315	+10.0	1,675	+ 3.7	1,586	+ 2.5
All other[3]	1,700	+ 6.6	1,737	+ 3.8	1,960	+ 4.2	1,830	+ 3.6	1,807	+ 4.6
Crude runs	**8,088**	**— 1.2**	**7,952**	**+ 0.5**	**8,105**	**+ 2.0**	**8,300**	**+ 4.7**	**8,112**	**+ 1.5**

(1) Partial estimate. (2) Estimated. (3) Beginning in 1960, commercial jet fuel, formerly included in the "All other" group, is now included with kerosine.

What Would Prorating to Reserves Mean?

That is one proposal that may be studied by a committee of the Interstate Oil Compact Commission as a means of "equalizing" production opportunity.

A Few States Could Increase Output:

	Reserves Ratio in 1959 to the U.S. Total (Crude and gas liquids)	Production Ratio in 1959 to U.S. Total	Production-to-Reserves Ratio would have allowed 1959 output of:	
North Dakota	1.3%	0.7%	37,290,097 bbl.	+93.3%
Texas	47.8	39.8	1,371,127,704	+20.0
Louisiana	15.7	13.7	450,349,476	+14.9

But Many Would Have to Cut Back:

Utah	0.6	1.4	17,210,808	—57.4
Illinois	1.6	2.7	45,895,550	—41.3
Colorado	1.1	1.7	31,553,148	—36.7
Kansas	2.9	4.4	83,185,572	—33.7
Oklahoma	5.8	7.7	166,371,202	—25.0
Wyoming	3.9	4.5	111,870,252	—14.1
New Mexico	3.8	4.2	109,001,784	—10.2
Arkansas	0.9	1.0	25,816,221	— 5.8
California	11.1	11.7	318,399,948	— 5.3

ONLY three major oil-producing states would benefit from a plan to prorate petroleum production based on reserves.

Such a proposal was placed before a committee of the Interstate Oil Compact Commission at its midyear meeting in Detroit last week.

The group, which goes under the imposing name of a committee for the "Study of Equality of Opportunity of Oil Production by the Sovereign Producing States," took no action on the proposal. The members did agree, however, to study the proposal and to reconvene at a later date—perhaps in early August.

The plan to prorate production to reserves was submitted by an Oklahoma independent who said, however, that ability of wells to produce may be a more important consideration than reserves.

Paul Schultz, president of the Oklahoma Independent Petroleum Assn., told the committee that, while a field could have large reserves, formation characteristics could reduce its ability to produce.

At the request of the committee, Schultz agreed to compile data on reserves and producibility for submission to the next meeting. He provided preliminary data at the meeting last week (table, above).

There is a wide area of disagreement among state conservation officials on market-demand proration.

In fact, there are some who seriously question whether such a study comes under the scope of the Compact Commission—which, they point out, is a conservation body and not a tool for proration purposes (PW—Jun.17'60,p30).

E. J. Davis, Jr., Oklahoma's official representative to IOCC and co-chairman of the study committee, for one, said:

"Let each state handle its own problem, based on reserves, producibility, and number of wells."

C. R. Henderson, chairman of the Utah Oil & Gas Conservation Commission, noted that market-demand proration is a "very complex problem, with a different view from every chair in which you sit." Henderson said that an educational program would be needed in each state, and added that Utah wants to recognize the problem and do its "fair share."

Earlier, Henderson told another IOCC committee that, "Utah's position on this newer concept of conservation will have to be carried forward into the future, for it is not possible, even if it were desirable, for us to adopt it at the present time."

At the moment, only six producing states prorate to market demand, and only two others could, under existing statutes.

The market-demand states are Texas, Louisiana, Oklahoma, New Mexico, Kansas, and North Dakota. Arkansas and Michigan can apply such proration.

Of these states only Texas, Louisiana, and North Dakota would benefit materially from a nationwide proration-to-reserves formula.

On the other hand Oklahoma, Kansas, and New Mexico would have to make substantial reductions.

While the purpose of such a plan would be to provide a fair share of oil markets to each producing state, and to prevent unnecessary surpluses, there is a growing belief that more than liquid petroleum may have to be considered.

John G. Winger, vice-president and petroleum economist of the Chase Manhattan Bank, suggested last week that "the industry will have to choose between oil and gas."

"There is not room in the market place," he commented, "for the amount of both that the industry has recently made available. Until the need for making such a choice is broadly recognized, the industry is unlikely to experience any lasting relief from oversupply."

Production of liquid and gaseous petroleum hydrocarbons from 1946 to 1956 in just two states—Texas and Louisiana—grew at a rate equal to 67% of the expansion of the total energy market, Winger noted. And since 1956, he added, the growth of production in those states has almost matched the over-all rise of energy requirements, with gas alone accounting for all of the gain.

The competition between petroleum fuels may require conservation agencies to change their basic philosophies for the future.

Minor S. Jameson, Jr., executive vice-president of the Independent Petroleum Assn. of America, noted that state conservation programs, as well as industry operations, have been geared to a steadily increasing demand for crude. But, he said, 1960 is the fifth consecutive year that total requirement for domestic and imported crude will average about 8-million b/d.

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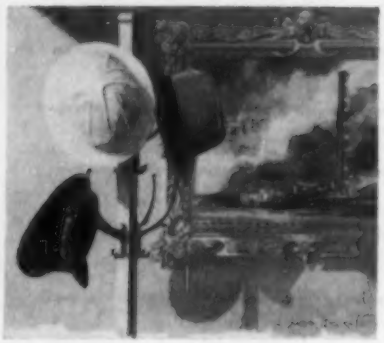

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What's New / IN THE INDUSTRY

Collective bargaining plans for the oil industry will be finalized next week by the Oil, Chemical & Atomic Workers International Union.

The union's newly established ten-man policy committee will meet in Denver Monday and Tuesday to sift and crystallize the recommendations made at five regional conferences earlier this year (PW—Apr.15'60,p13).

Principal items to be discussed at Denver will be wage demands, length of the work week, fringe benefits, and the use of outside contractors to do work normally performed by company employees.

The program, when it is completed, will be submitted to locals for approval by secret ballot.

•

The Montana Supreme Court, in a 3-to-2 decision, refused to stop the State Land Board from leasing state-owned lands for underground storage of natural gas.

The majority opinion dismissed the injunction suit of a private citizen who had contended that the 1955 leasing law was unconstitutional.

At issue was a lease negotiated by Montana Power Co., which called for $4,800 annual rental, and $50,000 for the native gas estimated to be in the ground at the present.

The two dissenters held that the utility is purchasing native gas by private agreement. But the majority ruled that the constitution does not require public auction.

•

A separate oil and gas conservation commission for Kansas has been suggested by Marion Beatty, of the Kansas Corporation Commission.

Beatty feels that the Corporation Commission's workload is too heavy to enable the commissioners to spend adequate time on policies and decisions.

The overload, he says, comes from railroad, motor carrier, public utility, and oil and gas cases.

•

Creation of a new operating division, Mobil Chemical Co., indicates that Socony Mobil Oil Co. is gearing itself for an intensified push in the petrochemicals field.

The new division will operate domestically and internationally, and will be headed by Paul V. Keyser, Jr., currently a senior vice-president of Socony Mobil.

In addition to being president of Mobil Chemical, Keyser will become an executive vice-president of the parent firm.

Mobil Chemical will have a wide-open field, including the possibility of undertaking joint ventures with other firms.

•

Hearings ended last week, but it may be some time before Alberta's Oil & Gas Conservation Board rules on Westalta Products Pipe Line's proposal to build a gas liquids pipeline to the U.S.

The board reserved decision pending study of alternative plans. Considerable opposition and criticism marked the hearings at Calgary.

Westalta's parent company, Pembina Pipe Line, Ltd., told the board at one point that the tariff would be 13¢ per bbl. less through its proposed line than through Interprovincial Pipe Line Co.'s link between Edmonton, Alta., and Superior, Wis.

Interprovincial representatives questioned the estimate sharply.

•

A weeklong "Energy Institute" opens Sunday at American University, in Washington.

Among those taking part are Minor S. Jameson, Jr., executive vice-president, Independent Petroleum Assn. of America; A. W. Neal, manager of planning and economics, Gulf Oil Corp.; Paul Kayser, president, El Paso Natural Gas Co.; Willard W. Gatchell, general counsel of the Federal Power Commission; and William R. Connole, FPC Commissioner.

•

New bids for Libyan acreage have been filed by Phillips Petroleum Co. and Shell Oil Co.

Phillips' three bids for offshore tracts in the Gulf of Sirte overlap bids filed previously by Atlantic Refining Co.

Shell's application for a 10,580-sq. mi. tract in southeastern Libya is a substitute for a bid for a larger area that had been withdrawn.

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Looking Ahead in Washington

McGraw-Hill
Washington
Bureau
June 24, 1960

The Federal Power Commission must decide if a contractually-escalated gas price can be cut in the public interest. Examiner Samuel Binder ruled that it could be and so recommended to the commission, which must review the case. Involved is a sales contract for 60.7-million cf/d of offshore Louisiana gas sold by Kerr-McGee and Phillips Petroleum.

The gas had been purchased by Tennessee Gas Transmission for delivery to Canada at an escalated price of 21.33¢ per Mcf. The initial price was 16.4¢ per Mcf., excluding state tax. But shortly after the escalation under the contract in late 1958, TGT acquired the purchase rights for delivery in the U.S., and has been buying at 21.33¢ since that time under a temporary permit.

The examiner ruled that the case is for an initial rate—rather than an increase. He held that the producers failed to satisfy the U.S. Supreme Court's CATC ruling that producers must prove initial prices to be required by public convenience and necessity.

•

Other problem cases are stacking up for the short-handed FPC. The commission must decide a price conflict between staff attorneys and Texas producers on expansion plans of two Peoples Gas System subsidiaries. The gas producers claim the FPC staff, in trying to cut a proposed price from 20¢ to 18¢ per Mcf., is ignoring going prices in the same Texas area.

Testimony is continuing in the rehearing for the CATC producers, highlighted by a dispute between the CATC group and would-be purchaser Tennessee Gas on the amount of offshore Louisiana gas reserves involved. TGT claims the reserves are about 1.3-billion Mcf.; CATC says they're about 697-million Mcf.

•

Congress may act soon on tax deductions for lobbying expenses. A bill to allow such deductions—now barred—has passed the House Ways & Means Committee, and thus has jumped a major hurdle toward becoming law. The bill's backers are hopeful of final House and Senate action before the session ends early next month. Some opposition may arise, but proponents fear the lack of time more than vocal opponents.

If the bill is enacted, numerous oil industry activities will become tax-deductible. The ban on lobby deductions has been a sharp thorn in the side of petroleum and other industries. Oil and gas men have spent some tedious moments before congressional investigating committees trying to differentiate between "public education"—acceptable for tax deduction—and "lobbying"—not currently acceptable. This difference would be eliminated under the proposed law—making all such expenses deductible.

•

Washington is encouraged by Venezuela's stand against Fidel Castro and Russian oil. U.S. diplomats now believe that Castro's harassment of U.S. refineries might be halted by one of two factors: a threat to reduce Cuba's lucrative U.S. sugar market, or a stern protest from Caracas against Russian crude replacing Venezuelan oil in Cuba (page 107). Congress is still wrestling with an extension of the Sugar Act and arguing about new powers for the President.

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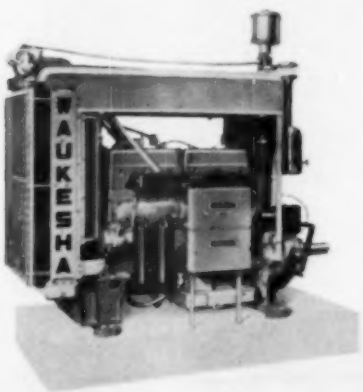

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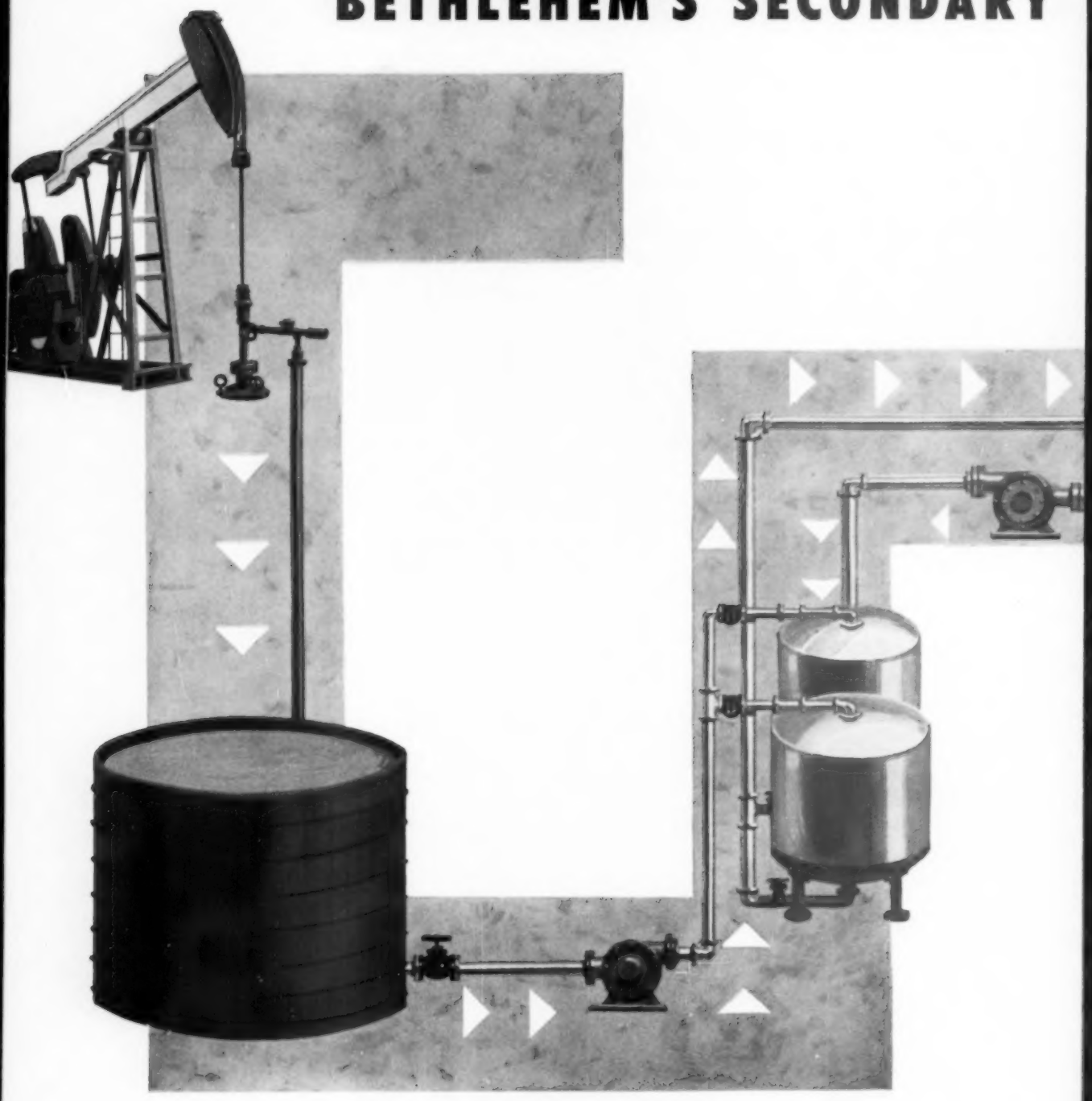

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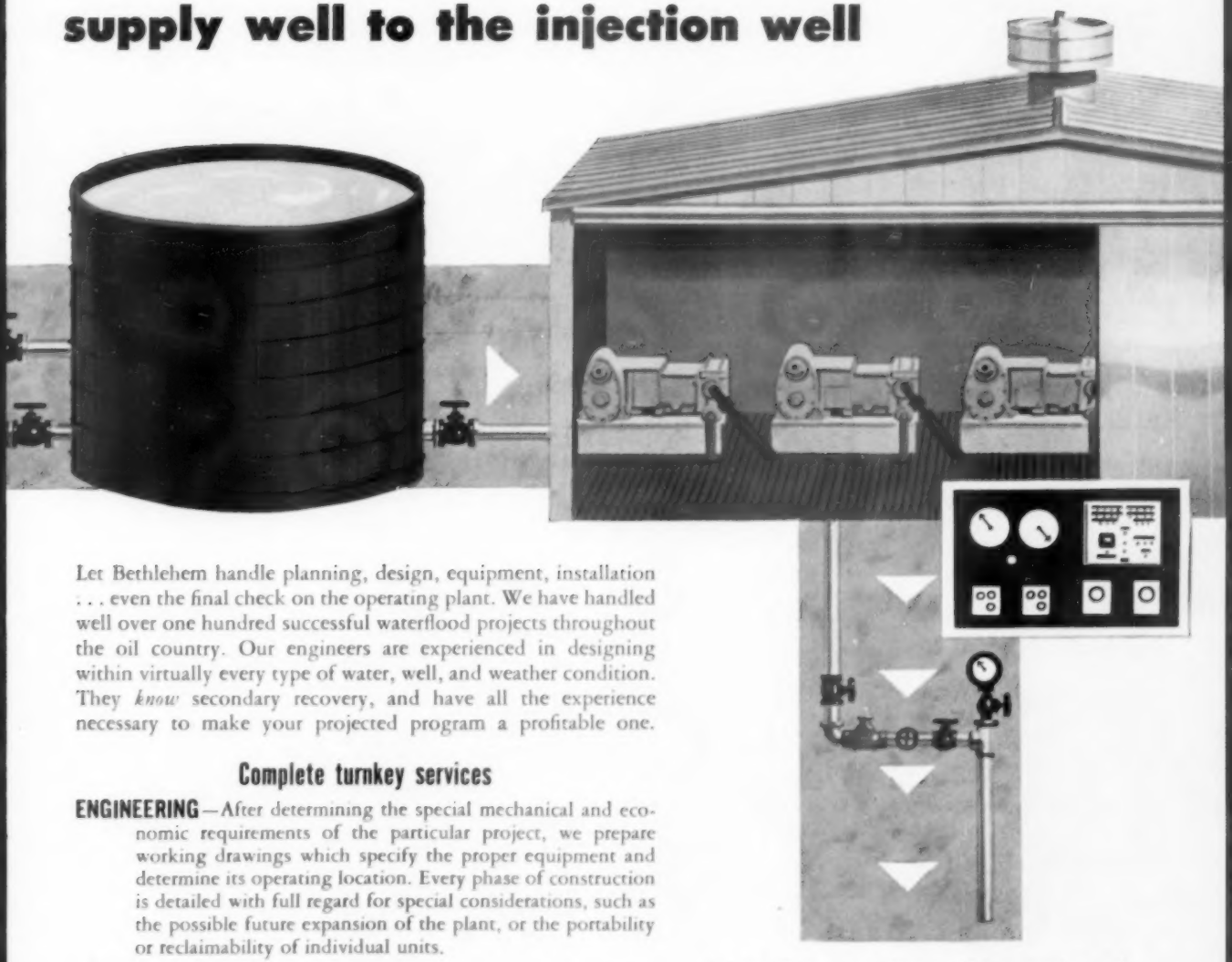

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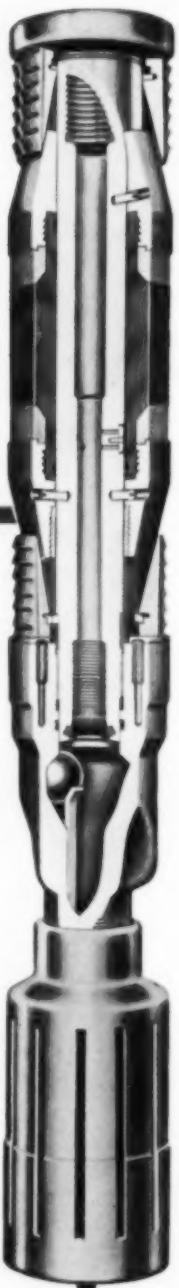

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Sour-Gas Problems Are Under Attack

Expanding demand for Canadian gas is impelling operators to develop better ways to produce and process highly sour gas.

Approval of gas exports from Canada has focused increased attention on the solution of problems associated with development of sour-gas reserves.

The significance of the problem is reflected by the increasing number of technical papers presented on the subject; by the growing total of new processing plants; and by new regulations in Alberta.

A recent study by the Alberta Oil & Gas Conservation Board shows that there are 65 areas in the province in which the hydrogen sulfide content of natural gas exceeds 5%.

The study, covering the period through November, 1959, preceded the board's recent ruling outlining special precautions for wells and batteries in such cases.

The 65 areas (undoubtedly there are more now) comprise roughly 16% of the 412 fields listed in the report. The Wabamun formation in 25-1w5 had the highest sour-gas content—45.72%. The Leduc formation in Wimborne field, with 40.68% and the Wabamun in Okotoks field, with 40.11%, topped the listed fields in percentages of sour gas.

The special precautions spelled out by the board are intended to increase protection against rupture or leaks in the production casing or wellhead, and to reduce the hazard from release of hydrogen sulfide into the air.

The board's field staff will begin inspection of all wells and batteries affected by its order in July.

The latest development involving sour-gas fields is a multimillion-dollar plan for gas-processing facilities to serve three Alberta fields jointly.

Pan American Petroleum Corp. last week invited tenders for construction of the facilities to serve the Windfall, Pine Creek, and Beaver Creek fields, in the Whitecourt area.

While no official cost estimate has been given, it's estimated that the project will entail expenditure of approximately $70-million.

Hudson's Bay Oil & Gas Co., Ltd., will be developer-operator of the Pine Creek and Beaver Creek pools, and Canadian Fina Oil, Ltd., will be developer-operator of the Windfall reservoir. Pan Am will be operator of the liquids plant, gas-sweetening plant, and sulfur-recovery facilities.

Gas from the three fields is among the highest in H_2S content in Alberta. The Leduc formation in Pine Creek has an H_2S content of 36.26%, and the field's Wabamun has 31.23%; Beaver Creek's Wabamun has 34.97%; and Windfall's Leduc has 18.06%.

One example of how high hydrogen sulfide content in gas is being curbed is the producing system set up in the Okotoks field.

Devon-Palmer Oils, Ltd., is operator of the field and related field facilities, which serve a big sulfur-extraction plant operated by Texas Gulf Sulphur Co.

The plant, which went into operation last summer, is designed to handle 30-million cu. ft. of raw gas per day, yielding 370 long tons of sulfur per day and 12.5-million cu. ft. of residue gas.

Five gas wells have been connected so far to the gathering system, and additional wells will be drilled.

The five wells are within a unit formed by Devon Palmer, Texas Gulf, and Shell Oil Co. of Canada, Ltd., which discovered the field in 1951, under a farmout.

There has been no trouble with hydrogen sulfide during drilling in Okotoks field. But considerable special equipment and techniques have been developed for production.

A low-carbon, low-tensile-strength steel (J 55) is used, as is an integral-joint tubing. The use of collared tubing has been discontinued because the integral-joint tubing appears more dependable.

Hydrogen sulfide attacks the outside of tubing and casing collars, causing longitudinal cracking of the collars due to hydrogen embrittlement.

The operator has departed from the usual glycol process for removing water from gas at Okotoks, and has installed special equipment at the wells.

A new approach was needed because use of glycol for dehydration results in absorbtion by the glycol itself of large amounts of H_2S. To prevent air pollution, it was necessary to remove the H_2S from the glycol before it entered the reboiler.

Stripper towers, packed with beryl saddles, were installed to remove the H_2S. Glycol is pumped into the top of the towers, taken out at the bottom, and pumped over to the reboiler. Sweet gas (from the plant) is injected into the bottom of the tower. As it passes up through the tower, it picks up the H_2S from the glycol and flows back into the gathering system.

The same process is used with the condensate.

The dehydration equipment was installed at an estimated cost of $100,000 per well.

A completed well in Okotoks field costs about $250,000, with well depths averaging from 8,500 to 8,900 ft.

The gathering system consists of short 4-in. laterals and 9 mi. of 10-in. main line, which connects with the plant. Included in the pipeline system is a 2-in. return gas line from the plant.

Extensive research has led to techniques for minimizing or avoiding production problems resulting from deep, high-pressure sour gas-condensate wells in Pincher Creek field.

A four-man team from British American Oil Co., Ltd., reported recently that operating experience plus laboratory studies have shown that the major technical problems and personnel hazards initially foreseen in the field have been largely overcome.

The four engineers noted that a nine-month field test had been made to observe design and control procedures for preventing H_2S stress cracking and corrosion.

They concluded that successful production of a high-pressure sour gas-condensate field is "contingent upon the judicious selection of materials, the design of production equipment, the fabrication techniques used, and an active corrosion control program."

The selection of materials used is of major importance at Pincher Creek.

The British American team said that carbon steels are suitable for well-site production equipment, interconnecting lines, and for gathering lines.

Where higher-strength alloy materials are necessary, they said, special heat treatment is required. They rec-

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ommended that components requiring high tensile strength and hardening characteristics should be made from K-Monel or properly heat-treated carbon-manganese-molybdenum and AISI 4140 steels.

They also noted that welded connections are a potential source of sulfide-stress cracking. Consequently, they added, high-quality welding and strict inspection are suggested.

Inhibitors have proved effective in minimizing corrosion of glycol dehydration units in Pincher Creek.

The British American engineers said that the glycol dehydrators were in operation nine months before an inhibitor was injected into the glycol system.

The quantity of the inhibitor—sodium mercaptobenzothiazole—added was adjusted to maintain a pH of 7.0 minimum. After 18 months of operation, the unit was inspected. It showed that corrosion of the trays decreased progressively from bottom to top, with the upper trays free of corrosion. There was no evidence of pitting, and general corrosion of the vessel walls appeared minor.

Further progress in the production and processing of sour gas is being made in the Carstairs field, where a processing plant and gathering system was completed a few months ago.

The gas produced at Carstairs contains 0.44% H_2S, 5.67% CO_2, and 35 bbl. of condensate per million cu. ft. of gas. The unitized field, which was discovered in April, 1958, is operated by Home Oil Co., Ltd.

Home's K. C. Milne reported that the company decided to use a two-phase gathering system, heaters for hydrate control, and a residue fuel gas line to provide sweet, dry gas at the wellhead.

Some key points of the system are: (1) The gathering system design pressure is 1,200 psig; (2) seamless API 5 L Grade B pipe is used; (3) drips and blow-off connections are installed at the four major line depressions; and (4) all lateral connections are brought to the surface and insulated.

It is expected that the use of sweet, dry fuel will make it possible to operate the field unattended during the night, since this will avoid the difficulties frequently experienced with systems using sour fuel. Milne believes the incremental investment for the sweet-fuel system will pay out in about two years because of labor savings.

Hearing Spurs Flood Requests

Five secondary recovery projects were included in the rush of requests filed before the Texas Railroad Commission hearing to consider proration of production from future projects.

The commission last week started its statewide hearing to consider prorating production from future waterflood and pressure maintenance projects.

The most interesting proposal is the enriched gas, dry gas, and water injection program outlined by Pan American Petroleum Corp.

The Pan Am injection program is aimed at the 8,400-ft. Wolfcamp limestone reservoir under its Midland Farms (deep) Unit, Midland Farms (Wolfcamp) field, Andrews County.

Initial plans call for injecting a total of 320,000 bbl. of LPG along with 500-million cu. ft. of gas, followed by 500-million cu. ft. of dry gas and then water.

Pan Am estimates that the program will increase recovery by 9-million bbl. of oil and that this is about 4-million bbl. more than would be recovered by a straight waterflood.

Some 8-million bbl. of additional oil are anticipated as a result of a cooperative waterflood in Means field, Andrews County.

The proposed flood is for the 17,000-acre Queen sand, which is found at about 4,100 ft. Humble division of Humble Oil & Refining Co. holds 75% of the acreage.

Two waterfloods in two fields in Zapata County are expected to yield an additional 7,050,000 bbl. of oil.

Texaco Inc. asked for approval to flood the entire West Jennings (3,000-ft. sand). The reservoir covers some 2,800 acres.

Texaco estimates that additional recovery as a result of flooding will amount to 4.75-million bbl.

In Escobas field, Sunray Mid-Continent Oil Co. seeks approval to flood 648 of the 1,200 productive acres in the Second Mirando sand at an average depth of 1,250 ft.

Additional recovery as a result of flooding is estimated at 2.3-million bbl.

An estimated 4,355,000 bbl. of oil may be recovered as a result of flooding in the Page field, Schleicher County.

Continental Oil Co. proposes flooding the 1,960-acre Strawn reef, found at 5,550 ft.

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Giant Waterflood Slated for Iraq

The world's largest pressure-maintenance waterflood of a single reservoir will get under way in the Kirkuk field of Iraq by early 1961.

The project, when it's completed, will involve injection of over 1-million b/d of water.

This compares with the giant Wilmington flood in California, where the daily injection rate is slated to reach over 1.1-million bbl. by Jan. 1, 1961. The Wilmington flood, however, was not inaugurated for the purpose of pressure maintenance, but rather to prevent further subsidence. In addition, production at Wilmington is from more than 30 reservoirs in a highly faulted area.

The Iraq Petroleum Co. project, which will counteract declining pressure at Kirkuk, is the first major effort of its type in the Middle East.

There are other projects, but none approach the scope of the IPC plan.

IPC, which is owned by Shell, British Petroleum, Compagnie Francaise Des Petroles, Jersey Standard, Socony Mobil, and the Gulbenkian interests, first discovered oil at Kirkuk in 1927. Since then the field has yielded over 1.5-billion bbl. Current production is about 600,000 b/d. IPC hopes water injection will enable the company to maintain, or even increase, that rate for many years to come.

There will be only six injection wells, spaced 3.1-mi. apart on both flanks of the 50-mi.-long field.

Four of the six wells are already completed, and a fifth is under way. Production in the field is from a limestone reservoir in the Tertiary—known simply as the main Kirkuk limestone.

Central to the project are three main injection pumps, each of which will be driven by a two-shaft, open-cycle gas turbine with 5,880 brake horsepower.

Each pump will be capable of delivering 10,000 Imperial gal. per minute (roughly 400,000 b/d) of purified water at 600 psi. through a pipe system to the injection wellheads. At the wellhead, there will be sufficient residual pressure for all injection requirements.

There will be no need for gas compressors. Gas will be available locally at high-enough pressure.

The water will be drawn from the Lesser Zab River, which runs across the field. Flow of the river is controlled by the recently completed Dokan dam. The water will be pumped by six borehole-type pumps, each driven by a 350-hp. electric motor, and capable of delivering 5,000 Imperial gal. per minute of water against 160-ft. head into six clarifloculators. The clarifloculators are equipped with mixing paddles, scrapper mechanisms, collecting launders, and sludging equipment.

From this point, the water will flow by gravity into a battery of sand filters to three filtered water balance tanks and a chemical mixing and dosing plant before passing to the suction of the main pumps. The plant will be fully automatic, except for filter back flushing, which is to be remotely controlled from a central operating panel.

Water purification is necessary to avoid incompatability with existing reservoir water.

The plans for counteracting declining pressure at Kirkuk were first put into operation in 1956-57.

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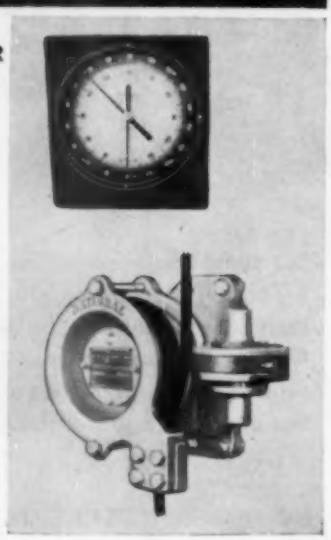

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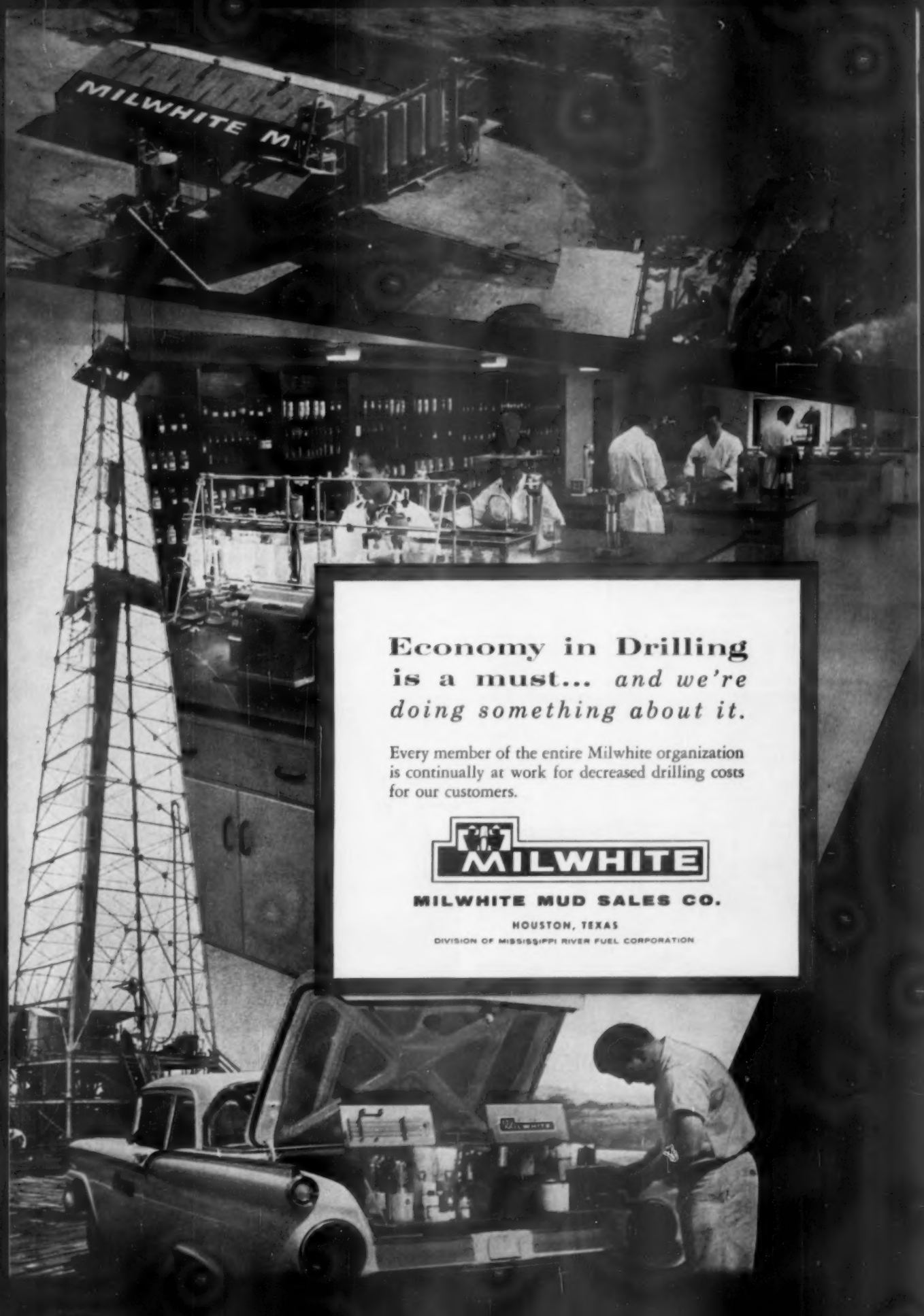
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Free World Geophysical Activity Drops

Worldwide geophysical activity in the free world was 8.9% lower in 1959 than in 1958. This marked the third straight year of decline.

This is one of the principal findings of a report issued this week by the Committee on Geophysical Activity of the Society of Exploration Geologists. Part of the report—dealing with U.S. activity—was previously published (PW—Apr.22'60,p40). Homer G. Patrick, chief geophysicist for the Humble division of Humble Oil & Refining Co., prepared the report.

The committee noted that no information is available as to the amount of activity in the Soviet Union, Red China, and countries within their sphere of influence.

Over-all geophysical activity—seismic, gravity, magnetic, and other—totaled 11,481 crew-months in 1959, compared with 12,601 in 1958.

The biggest drop—41.6%—was in the "other" category. Declines of 28.8% were posted in magnetic work and 20.1% in gravity surveys.

Seismic activity, which forms the largest single category, dropped only 5.8%, from 10,326 crew-months to 9,723.

The 1958 total was 7.7% below the 1957 figure of 13,693 crew-months. And the 1957 figure, in turn, was 1.2% lower than the 13,628 crew-months posted in 1956. That figure was up 1.5% over the 13,430 crew-months recorded in 1955.

All major areas of the free world except the Far East showed declines in activity last year, with the biggest drop posted in Canada.

Canada had an over-all decline of 25.6%, with 841 crew-months compared with 1,130 in 1958. Seismic activity dropped from 1,065 to 796 and gravity work dropped from 65 to 41.

The U.S., as previously reported, showed an over-all decline of only 0.61%. But seismic activity rose 0.65%, from 5,064 crew-months to 5,097 crew-months. The big drop in the U.S. was in gravity exploration—down 10.5% (from 612 crew-months to 548).

For the Western Hemisphere, the over-all decline was 5.1%, with 8,015 crew-months last year compared with 8,547 in 1958.

In this area, seismic activity again held up better than other categories, dropping only 3.6% to a total of 6,988 crew-months.

In addition to the U.S. and Canadian totals, there were 1,159 crew-months posted in South America last year, compared with 1,327 in 1958. Central America had 55, compared with 97; and Mexico had 264, compared with 263.

A big reduction was recorded in the Eastern Hemisphere, where 1959 activity dropped 14.5%. Europe again was the most active area.

The over-all totals for the hemisphere were 3,466 crew-months in 1959, and 4,054 in 1958.

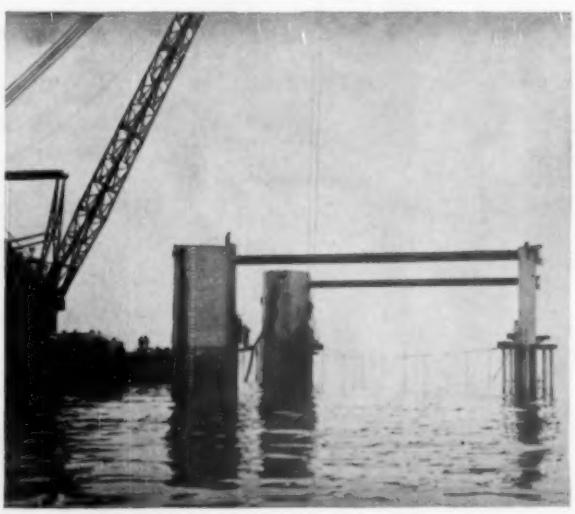
The Eastern Hemisphere totals are broken down for Europe, Africa, the Middle East, and the Far East.

The over-all number of crew-months in Europe fell from 1,749 in 1958 to 1,225 last year. Of this total, seismic activity totaled 1,026 crew-months in 1959, compared with 1,417 in 1958.

West Germany continued to lead European nations in activity, but the 1959 total of 512 crew-months was well below the 609 of 1958.

Italy ranked second, with 255 crew-months, compared with 302 in 1958. France dropped to third ranking with 207 crew-months, less than half the 464 posted in 1958.

Contract geophysical companies did 73% of the seismic work, 73% of



Meet Hilda, California's Second Offshore Platform

The tower base for the drilling platform Hilda arrives at its erection site offshore Summerland, Calif. after being towed on its side from San Pedro. The base was upended and settled in 106 ft. of water by flooding its hollow legs with water. The new platform, which cost around $3-million, will have facilities for drilling 24 holes, two at a time if desired. The main deck will be 120 ft. square and 58 ft. above water level. The tops of the two derricks will be 217 ft. from the water surface. Hilda is the second platform to be put on this state lease held by Standard Oil Co. of California and the Humble division of Humble Oil & Refining Co. It is about 1¾ mi. from Hazel, the first platform on the lease, which has been in operation since 1958. A pipeline will be laid from Hilda to Hazel, which in turn is connected to onshore storage facilities at Carpenteria.

the gravity work, and almost all of the work of other types carried out in Europe last year.

The over-all total in Africa was down slightly—from 1,167 crew-months to 1,152—but seismic activity showed a sharp increase, rising from 829 in 1958 to 1,019 in 1959.

Algeria and Libya continued to lead this area, accounting for more than half the total work on the continent. Libya had a total activity of 350 crew-months, and Algeria had 331. Nigeria ranked third, with 98, followed by Mozambique and Senegal.

The Middle East dropped from 589 crew-months in 1958 to 492 last year.

Iran led Middle East countries with 106 total crew-months, followed closely by Turkey, with 105. But while Iran showed an increase over 1958's total of 90, Turkey dropped heavily from the 200 crew-months posted in 1958.

Oman, with 85 crew-months, and Iraq, with 75, ranked third and fourth. Oman was up sharply from the 12 crew-months listed in 1958, whereas Iraq dropped slightly from 78.

The Far East posted the only gain in free-world geophysical activity, rising from 537 crew-months in 1958 to 597 last year.

Strangely, however, this area showed a decline in seismic work—from 382 to 335. This was more than offset by increased use of gravity and magnetic methods, with gravity up from 141 crew-months to 198, and magnetic up from 10 to 60.

India, with 162 crew-months, led the area, followed by Japan, with 107.

Dipmeter Usage Widens

The continuous dipmeter, already well-established as an instrument for various geological uses, is now finding increasing application in a new area—the plotting of structural geology.

The tool was developed in 1952 by Schlumberger Well Surveying Corp. to define magnitude and direction of formation dips across a borehole.

It helps establish presence or absence of structure by showing dip trends and pinpotting dips on reservoir formations.

It also aids in locating offset wells and in sidetracking, and enables better reservoir evaluation by computing thickness of the producing zone.

By taking numerous dip determinations at close intervals, it is now possible to locate faults, unconformities, salt overhangs, bars, and pinchouts, says Schlumberger.

To do this, the company recommends that the operator:

(1) Run the dipmeter survey over as much hole as can possibly be of interest; and

(2) Compute dips at as many points on the curves as can possibly be correlated and plot these values on the dipmeter chart without preconceived ideas as to expected results.

For successful interpretation, the company emphasizes, dips must be computed at close intervals.

Variations from the established trend shown by the dipmeter log must be noted for structural determination, says Schlumberger.

With sufficient levels computed, these variations will generally form patterns of changing dip and/or direction.

Drawing a line connecting all plotted points will assist in distinguishing those levels or groups of levels which indicate structural features from those due to crossbedding.

Each zone must be studied and correlated with electric and sonic logs. And any changes in resistivity or velocity associated with irregular dips must be noted.

Such changes, Schlumberger says, are often due to compaction or alteration associated with faulting.

With the dip data checked and correlated with well logs, and confirmed as well as possible by other interpretation, the company adds, the structural interpretation is a matter of associating the pattern of dip changes with those geological features characteristic to these changes.

Faulting may be apparent on the dipmeter survey simply by a sudden change in dips from one fault block to another.

The most common indication on the lower Gulf Coast, says Schlumberger, is the result of "rollover," or slumping of formations on the downthrown side against the fault.

This manifests itself on the dipmeter chart by a progressive change in dips as the borehole nears the fault.

Other Schlumberger observations based on Gulf Coast experience:

(1) Regional or depositional faults evidence more rollover than do domal faults.

(2) Drag below the fault is often

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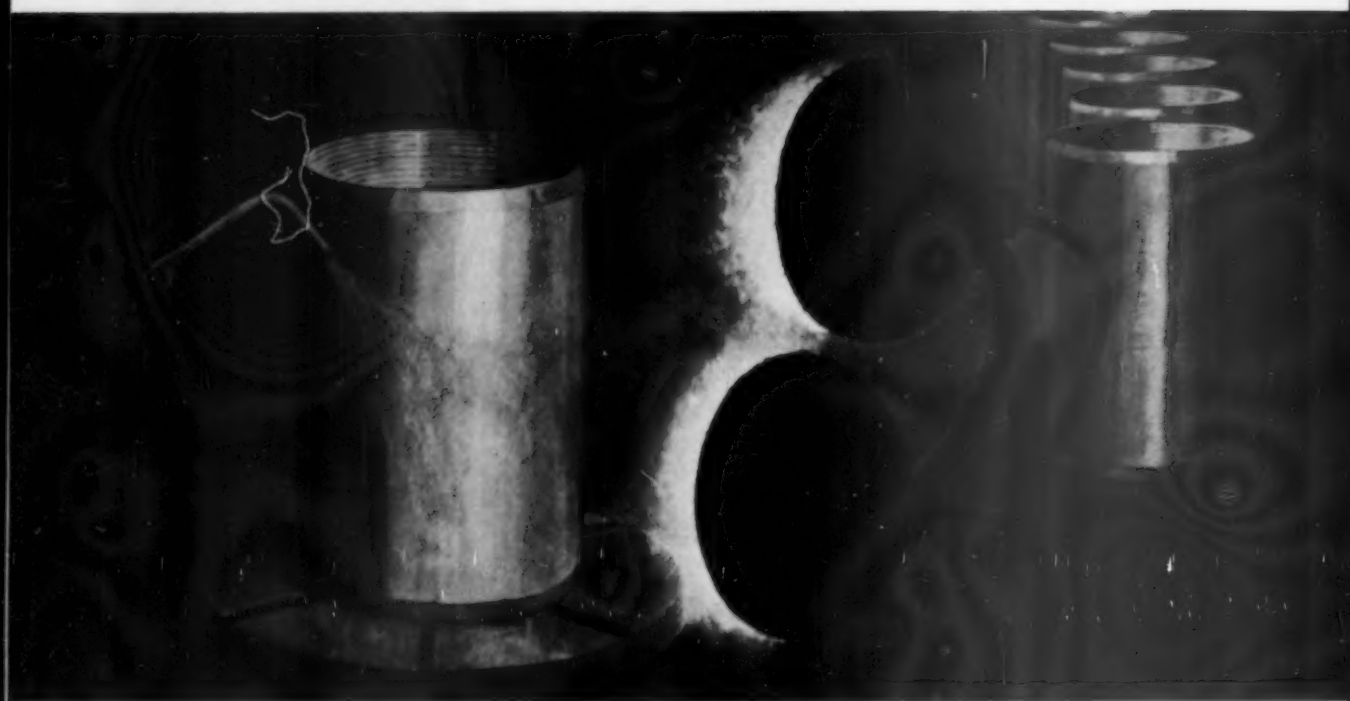

The coupling is magnetized; then drenched with a reddish-brown solution that contains magnetic particles coated with fluorescent dye. If there is a surface defect on the coupling, fluorescent particles cling to it—held by the magnetic field which builds up around any imperfection in the steel.

The inspector then slowly rotates the coupling on a potter's wheel. He scans it carefully for any tell-tale gleam that clearly indicates an imperfection.

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evident but usually limited. This is shown by rapid recovery to normal dips below the intersection of the borehole with the fault plane.

Unconformities are evident on the dipmeter log when changes in amount or direction of dip occur in the subsequent deposition.

Since unconformities are generally spread over a considerable area and are often associated in position with marker formations on the electric log, they are rather easy to recognize if the change in dip is present, Schlumberger adds.

The profile of salt overhangs shows up very clearly on continuous dipmeter surveys, the company says.

A dipmeter survey in a hole drilled adjacent to, but not through, a salt overhang, shows that the dip angles increase with depth as the hole nears the overhang: reach a maximum opposite the overhang: and decrease below the overhang. A line drawn through the dip calculation will give the profile of the salt face.

Lenticular sands or bars are indicated by the dipmeter when the borehole penetrates the steep sides.

In such locations, Schlumberger explains, the top of the bar is shown by the sudden increase in dip.

The younger beds immediately above the bar assume dips close to that of the steep side of the bar. Progressing upward, the successive beds flatten out until structural or regional dip again appears.

Schlumberger says the following criteria hold in making interpretations for bars:

(1) The dip at the base of the sand is structural dip;

(2) The top of the sand exhibits a higher-than-structural dip; and

(3) These higher dips are distinguished from crossbedding by the fact that, if they were the result of crossbedding, they would be confined within the sand in which they appear instead of carrying upward through younger beds.

Dipmeter results may be used in contour mapping and in vertical cross sections, says Schlumberger.

In contour mapping, the company advises mapping no more than one contour above and below a computed point on the dipmeter survey, since the dip can't be assumed to remain constant over a larger area, and using the average of dips over an interval rather than a specific point.

In vertical cross sections, the company says it is necessary to convert each dip to its component in the plane of the section.

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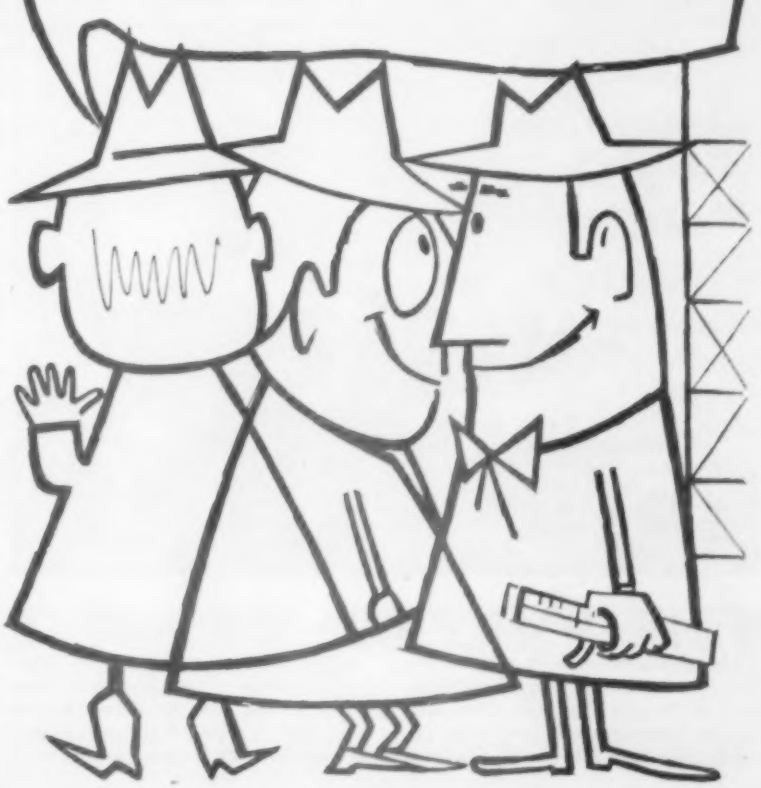

What's New / IN EXPLORATION, DRILLING, PRODUCTION

There were 779 unit projects in 16 states as of Jan. 1, 1959, reports the Subcommittee on Unitized Oilfield Conservation Projects of the Interstate Oil Compact Commission.

The report, edited by Albert E. Sweeney, Jr., IOCC's Director of Technical Services, also lists 398 units formed under the management of the Dept. of Interior.

The compilation shows that oil produced from the 779 units totaled 357,004,999 bbl. in 1958. Oklahoma had the largest number of projects—197—followed by Texas with 137, and Illinois with 135.

•

Tidewater Oil Co. has solved a "running sand" problem in the Kern River (Calif.) field. In the process, it has also boosted production by a liner replacement program.

The problem showed up in shallow (about 1,000 ft.) wells after the installation of bottomhole heaters. The wells, drilled in the late 1940s and in the 1950s had originally been completed with 6⅝-in. liners having mesh sizes ranging from 120 mesh to 180 mesh. Sand began to run through the perforations after heaters were installed, requiring frequent cleanouts.

Experimentation last year indicated that 6⅝-in. liners with 80 mesh eliminated the running sand problem. As a result, the company recently replaced liners in 35 wells, obviating frequent pulling jobs and increasing production by an average 10 b/d per well. Cost averaged from $3,500 to $4,000 per well.

•

Shell Oil Co. plans at least two development tests at one of the strangest oil fields in the U.S.

The company plans to drill the holes at Eagle Springs field, Nye County, Nev., to learn more about its source of production. The field, opened in 1954, represents the first commercial production in the state.

Three wells currently produce from different sections—one from volcanic debris, another from limestone, and the third from still a different rock source. Shell wants to learn where the oil migrated from.

•

The Texas Supreme Court has made final its decision that a severance tax must be paid on cycled gas when it is sold.

The court's final stand became apparent when it refused to rehear a case involving Francitas Gas Co.

The company has paid more than $120,000 in taxes under protest on production from Francitas field, Jackson County, over a period of almost ten years.

Francitas contended that the state is collecting taxes twice on the same gas since its previously paid state levy on the liquids extracted before the gas was returned to the reservoir.

•

A research team at the University of Oklahoma is investigating the use of radioisotopes to determine the effectiveness of "below ground treatment" of brines used in waterflooding.

Robert N. Thompson, who will direct the study, said that the various metaphosphates and citric acids and salts added to brine to help prevent corrosion and plugging show promise as an inexpensive way to treat brine, but that the method is difficult to evaluate.

In the evaluation study, the brines will be tagged with various isotopes and the radioactivity measured to check the sequestering power of the compounds.

•

Two $6-million recycling plants will be built in Aberta's Harmattan Ekton and Harmattan East fields should markets develop and pipelines be built.

The plan was disclosed at a recent hearing of the Alberta Oil & Gas Conservation Board on an application of Westalta Products Pipe Line Ltd. for permission to construct an integrated gathering system in the province as part of an over-all $150-million project to export surplus propane, butane, and condensate to the Great Lakes.

The Harmattan Elkton plant would be designed to handle 110-million cu. ft. of gas daily and the Harmattan East plant 100-million cf/d.

•

Controlling interest in President Laboratories, Inc., Shreveport, La., has been sold to a group of Laurel (Miss.) businessmen.

President manufactures and mar-

Crewboat Gets Venezuelan Assignment

This all-aluminum, 50-ft. crewboat can carry 32 passengers at a sustained cruising speed of 36 mph. The boat, shown here on Lake Ponchartrain, New Orleans, La., was built for George Engine Co., and sold to Tidewater Marine Service, C.A., which will operate it on Lake Maracaibo, Venezuela. It was built by Sewart Seacraft, Inc., and is powered by two General Motors Series 71 V-12 engines.

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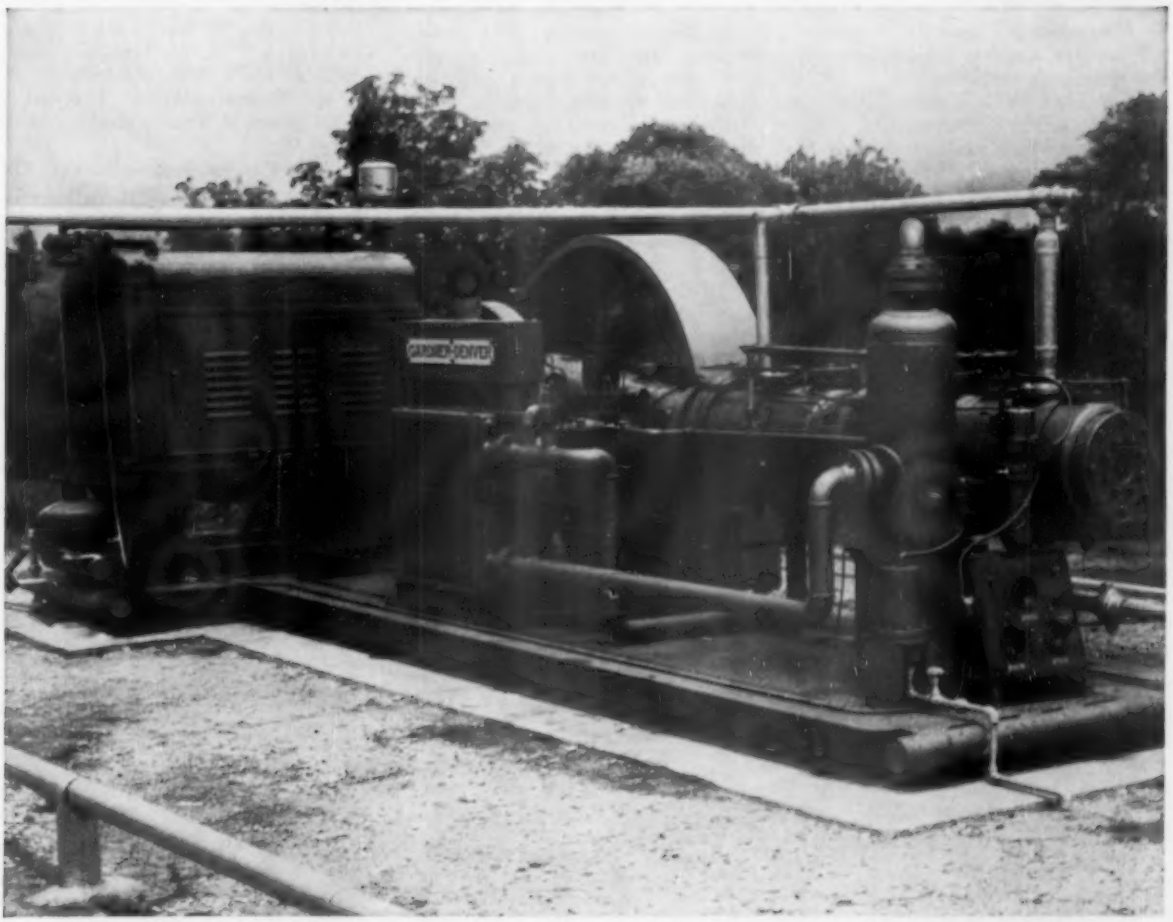

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kets "Prescose" nonfermenting starch for drilling muds. J. W. Hoss is new president of the firm.

•

Engineering

A tapered drill pipe that is thicker at the box end has been developed by Pittsburgh Steel Co.

The Dual Weight pipe is said to have the strength advantage of heavy drill pipe without the additional weight or expense.

The company says that the design gives 18% to 36% more body strength in the slip area to regular drill pipe used on heavy rigs. End strength of regular weight pipe for heavy rigs is said to increase from 10% to 30%. Weight per ft. of drill strings, however, is reduced, the company adds.

National Supply Co. has developed an "economical tubing head for medium and shallow wells" not requiring a more complex assembly.

The tubing head, known as National Type "K", has a "full opening" bore and is available with female casing connections of 5½ in. and smaller.

It also can be provided with a 7-in. male casing connection, which has a 5⅛-in. body-through bore.

National says optional thread of slip suspension for 2⅜-in. or 2⅞-in. OD tubing is obtained with interchangeable mandrel hangers and slip packing units.

A compact tubing joint having threads that are interchangeable with existing API tubing has been introduced by Atlas Pipe, Inc.

The tubing joint is aimed at reducing the cost of completing shallow to medium depth oil wells. The company reports that tubing up to 2⅞ in. with the new joint is now being finished in the company plant in Houston.

•

Drilling Highlights

West Texas—Southern Minerals Corp. and General Crude Oil Co. No. 1 Jasper County school lands, block 104, Jasper County school land survey, Pecos County, recovered 3,600 ft. of oil on 4-hour drillstem test at 5,986-6,103 ft. in what is believed to be the Wolfcamp. Earlier recoveries were 3,440 ft. of oil on 90-minute drillstem test at 6,068-93 ft. and 45 ft. of oil on 90-minute drillstem test at 5,444-900 ft. in the Clear Fork. Operator at last report was drilling toward target depth of 11,000 ft. to test the Ellenburger. The prospect is 3 mi. northwest of Hokit field.

Wyoming—Davis Oil Co. No. 1 O'Connor, section 30-52n-69w, Campbell County, was completed on pump for 295 b/d of oil through perforations at 5,975-89 ft. and 6,005-14 ft. in the Muddy formation. The well is 9 mi. north of Rozet (Muddy) field.

West Central Texas—Kewanee Oil Co. No. 1 Stiles, section 1209, block C, D&SE survey, Reagan County, flowed 51.77 bbl. of condensate in 10 hours through 16/64-in. choke and perforations at 10,373-82 ft. in the Fusselman, and 65.9 bbl. of oil and 2 bbl. of water in 10 hours through 13/64-in. choke from 10,441-553 ft. in the Ellenburger. The wildcat is 4 mi. south of Stiles field.

Montana—Sumatra Oil No. 2 Stensvad, section 35-11n-30e, Musselshell County, recovered 500 ft. of gassy oil and 270 ft. of heavily oil-and-gas-cut mud in 1½-hour drillstem test at 4,589-604 ft. in the Tyler sand. The prospect is 3 mi. southwest of Ivanhoe field.

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Operators Are Fighting Hard To Lick Production Problems

Keeping costs in line and trying to recover more oil from reservoirs continue to be the top production problems. This double squeeze is taxing the know-how of operators as never before. But the challenge is being met.

The producing segment of the petroleum industry today is much like a boxer who's been cuffed around for a round or two but knows, nevertheless, that he has the strength and know-how to come out on top.

Operators are still having a rough time trying to combat their two principal problems: (1) how to keep costs in line; and (2) how to recover a greater portion of the oil in place. These major double troubles have been compounded by such related factors as oversupply, imports, eroding prices, high refinery runs, and many more.

Operators, however, are still faced with the tactical nuts-and-bolts problems that tend to overshadow the "big" problems. And nowhere is the dynamism of the industry and the men who make it so more reflected than by the many changes in tools and techniques, new operating concepts, and significant trends.

A Petroleum Week survey shows that operators are throwing two strong counterpunches: (1) They are putting more effort into gas production, and (2) they are placing mounting emphasis on secondary recovery.

The survey shows that gas production will be emphasized so strongly within five years that the old oilfield saw about "digging for oil and finding gas" will no longer be said with a taint of sarcasm but, more likely, with a tint of hope.

As for secondary recovery, an example of the accelerating growth in this direction is given by some Texas figures. So far this year the Texas Railroad Commission has authorized such projects at the rate of 11 per week. This compares with an average of 7.8 per week in 1959.

A recent report of the Louisiana Dept. of Conservation shows that, as of early 1960, there were 143 reservoirs, in 69 fields, in which some form of secondary recovery was under way. The commission estimates that there will be 180 such reservoirs by year-end.

Other significant operating trends also are being felt in the industry, and more are in the making.

These trends, the survey shows, include:

- Complete planning and development of a field from the time of discovery.
- More multiple and tubingless completions.
- Advances in use of, and application of, automation.
- Greater attention to improving production from old wells.
- More joint ventures, as capital needs increase, with unitization showing more impetus.

Emphasis Is on Gas

The growth of gas production is readily seen by checking production figures over the years and by looking at estimates for the future.

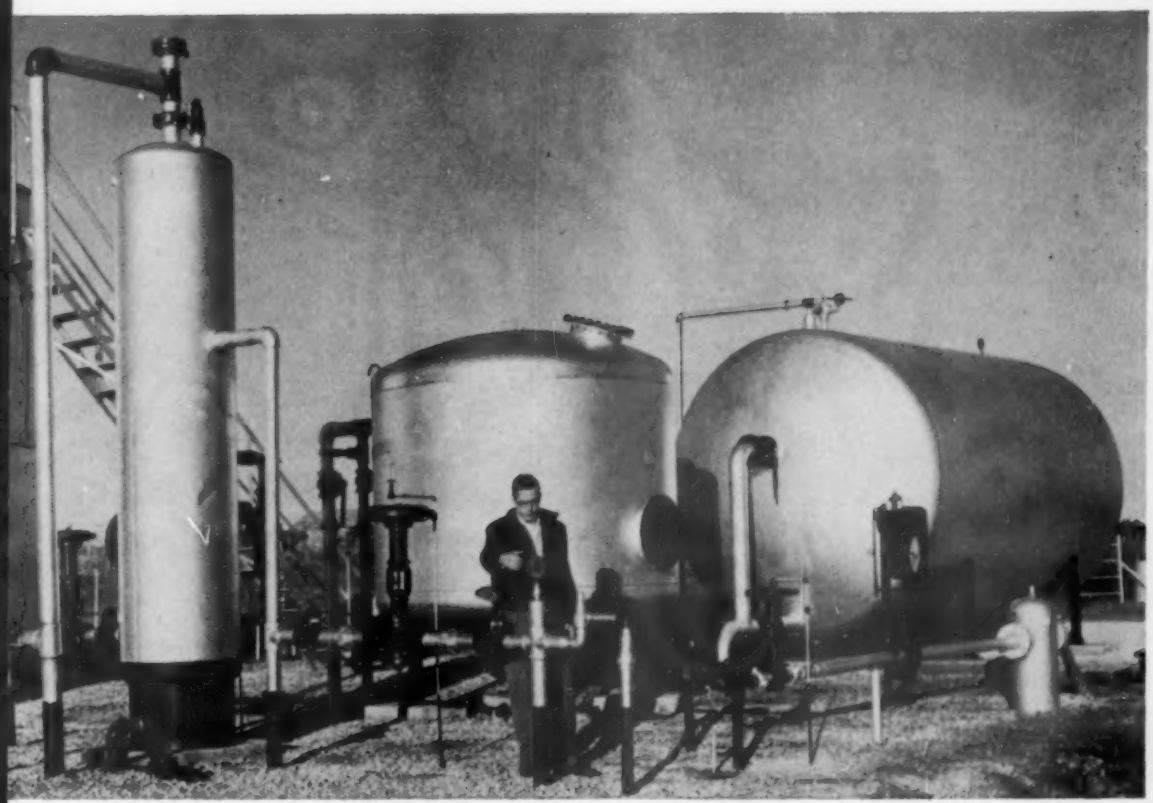
In 1947, 5.7-trillion cu. ft. of natural gas were produced in the U.S. This figure jumped to 12.4-trillion cu-ft. in 1959. Additions to proved reserves in the same period totaled 231-trillion cu. ft., well above the 116-trillion cu. ft. consumed. By the end of 1959, gas reserves totaled 262.6-trillion cu. ft., 21.1 times the 1959 production.

A Chase Manhattan Bank estimate of future demand shows a predicted increase of 51% from 1957 to 1967 in over-all energy requirements. John F. Lynch, of Texas Eastern Transmission Co., estimates that natural gas production must be increased approximately 50% by 1967, to about 17-trillion cu. ft. per day, to meet its share of these estimated energy requirements.

The 1959 annual report of Standard Oil Co. (N.J.) noted that the company's gas reserves in the U.S., in terms of energy content, exceed the company's domestic crude reserves.

One Midwest major predicts that the increasing share of the energy market taken by gas should lead to a 6% annual increase in gas consumption at least through 1965.

Without exception, all companies reporting in the Petroleum Week survey expect their totals of gas and gas liquids production to rise substantially in the next five years.



GAS AND WATER INJECTION project at Northeast Elmore pool, Okla., typifies surging interest in secondary recovery.

One major company told PETROLEUM WEEK, "Our gas production has increased 50% since 1956, while our crude production has risen only 30%. So it is obvious that gas is becoming more important to our production picture. The gas ratio would be even greater if the Federal Power Commission hadn't been so dilatory in approving pending applications."

In 1954, Phillips Petroleum Co. produced an average of 110-billion cf/d of gas and 120,500 b/d of oil and condensate, a ratio of 9,000 cu. ft. of gas per bbl. of oil. By 1959, natural gas production had increased to 130-billion cf/d, while oil and condensate increased to only 123,500 b/d, for a ratio of 10,500 to 1.

Many factors are contributing to the surge in gas production.

One large Midwest independent says the demand for gas should continue to grow faster than the demand for crude in the next five years "because many present-day non-gas consumers are recognizing the desirability of this source of energy, and because it is less costly to equip and produce gas wells than oil wells of a comparable depth."

A major reports: "We feel that we will be producing a greater ratio of gas as time goes on because deeper drilling in almost all areas is more likely to develop gas than oil. So, too, the quicker return of investment for gas wells as compared to low-allowable oil wells in some measure balances the difficulties in dealing with FPC, and the like."

L. E. Fitzjarrald, Phillips' vice-president for production, also looks for more gas as a result of deeper drilling.

Fitzjarrald adds: "Phillips' exploratory efforts during 1959 were devoted about 60% to the search for gas, 40% to the search for oil. As the industry is forced to drill deeper and deeper, it is finding less oil and gas per foot of hole drilled, and the proportion of gas to oil discovered has increased to the point that the industry must depend more and more on revenues from gas to carry on further exploration."

R. L. Bolin, Wichita Falls (Tex.) independent, gives still another reason: "Frankly, it is our opinion that the production of natural gas holds the greatest promise for the oil and gas industry in the future. This is based on the old law of supply and demand, plus the fact that as of now foreign gas cannot be imported except from Canada and Mexico. It is our hope that our gas-to-oil ratio will increase in the next five years."

On an energy-cost basis, natural gas is priced far below crude at the wellhead. Bureau of Mines figures show that gas prices last year were about $1.70 per bbl. less than crude, on an equivalent energy basis, giving gas a big edge in the home-heating and other markets supplied by distillates.

This is offset somewhat, however, by the fact that it costs from five to six times more to transport natural gas than oil, on a Btu. basis.

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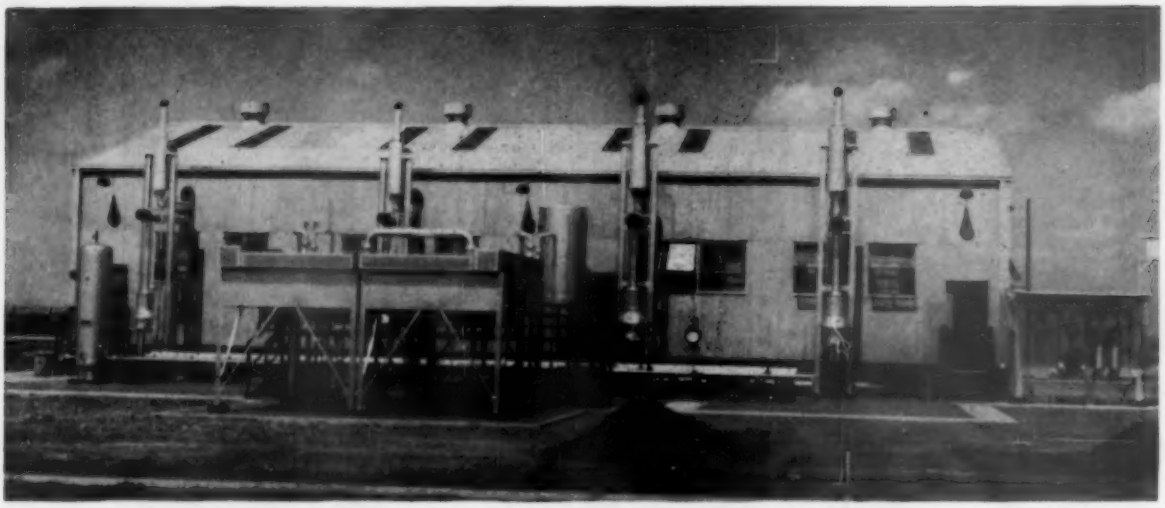

UNITIZED TURNKEY WATER PUMPING FACILITY was built by Southwest Industries, for use in Willamar West field, Tex.

Secondary Recovery Is Bigger

Economics, as could be expected, is the prime determinant in making secondary recovery more important.

The reasons are many. The finding of new reserves is becoming more difficult each year, and much more expensive. Producing more oil by supplementary methods is cheaper than finding new reserves.

Many fields are reaching a stage where secondary recovery becomes necessary if production is to be maintained, and maximum return from the property realized.

Incentives offered by many state regulatory bodies favor secondary-recovery production.

And, too, there has been increasing know-how in secondary recovery operations, along with development of new methods, some of which promise to be the "tertiary recovery" method the industry has long sought.

The trend toward earlier application of secondary recovery is becoming so great, in fact, that distinctions between pressure maintenance and secondary recovery are fading. One official of a Mid-Continent major suggests that perhaps all such projects should be classified under the single heading of "fluid-injection projects."

The many advances in methods of secondary recovery complicate the picture for operators.

Norris Johnston, president, Petroleum Technologists, Inc., Dallas, summarizes the situation this way:

"New methods of securing additional recovery of the oil in place are coming thick and fast—faster than at any time in my memory.

"And some of these new methods work. The big problem is to determine how and under what conditions they work the best, and to match up the reservoir and the method. Obviously, a technique will work in one reservoir and not in another—some reservoirs are suitable for waterflooding, and some should never be waterflooded."

Major emphasis is still on the older fields, with waterflooding the preferred method, due largely to its relative economy.

California furnishes a good example of this trend. The first waterflood was undertaken in that state in 1946. By 1955 there were 34 active waterflood projects, with 92 injection wells and a total water-injection rate of 73,000 b/d.

Today, California operators are injecting a total of 673,000 b/d of water into 49 different fields, with projects varying in size from 50 b/d to the 400,000 b/d being injected into the Wilmington field, the world's largest waterflood (PW—Nov.27'59,p19).

Some observers say waterflooding may boost California production to about 1-million b/d again by 1965, in a reversal of the declining production that has marked the state in the past few years.

The importance of waterflooding is further underscored by some giant projects just being started in Texas, with several more slated for early activation.

Southland Royalty Co. will take over July 1 as operator of the first waterflood project in the huge Spraberry Trend in West Texas. Target date for the first phase of injection is Sept. 1.

The first phase of the project will include seven injection wells, through which Southland will inject some 21,000 b/d of water. Ultimately, about 60 injection wells are planned (PW—Apr.8'60,p55).

This flood, covering some 15,776 acres in Reagan County, will be the largest ever attempted in a heavily fractured formation. The area takes in about one-fifth of the Spraberry Trend, being 9 mi. long and 3 mi. wide.

In addition to the Southland Royalty operation, four other flood projects have been announced for the Spraberry Trend, and several more are in the planning stage.

Monterey Oil Co. expects to begin full-scale injection of water into the 500-well North Dome reservoir of the Fullerton-Clear Fork unit in Andrews County by around year-end. The company plans ultimately to inject 120,000 b/d of water through 105 injection wells. Two pilot floods have been in operation in the field since 1956.

Engineers estimate that the unitized waterflood of the North Dome will increase production by an additional

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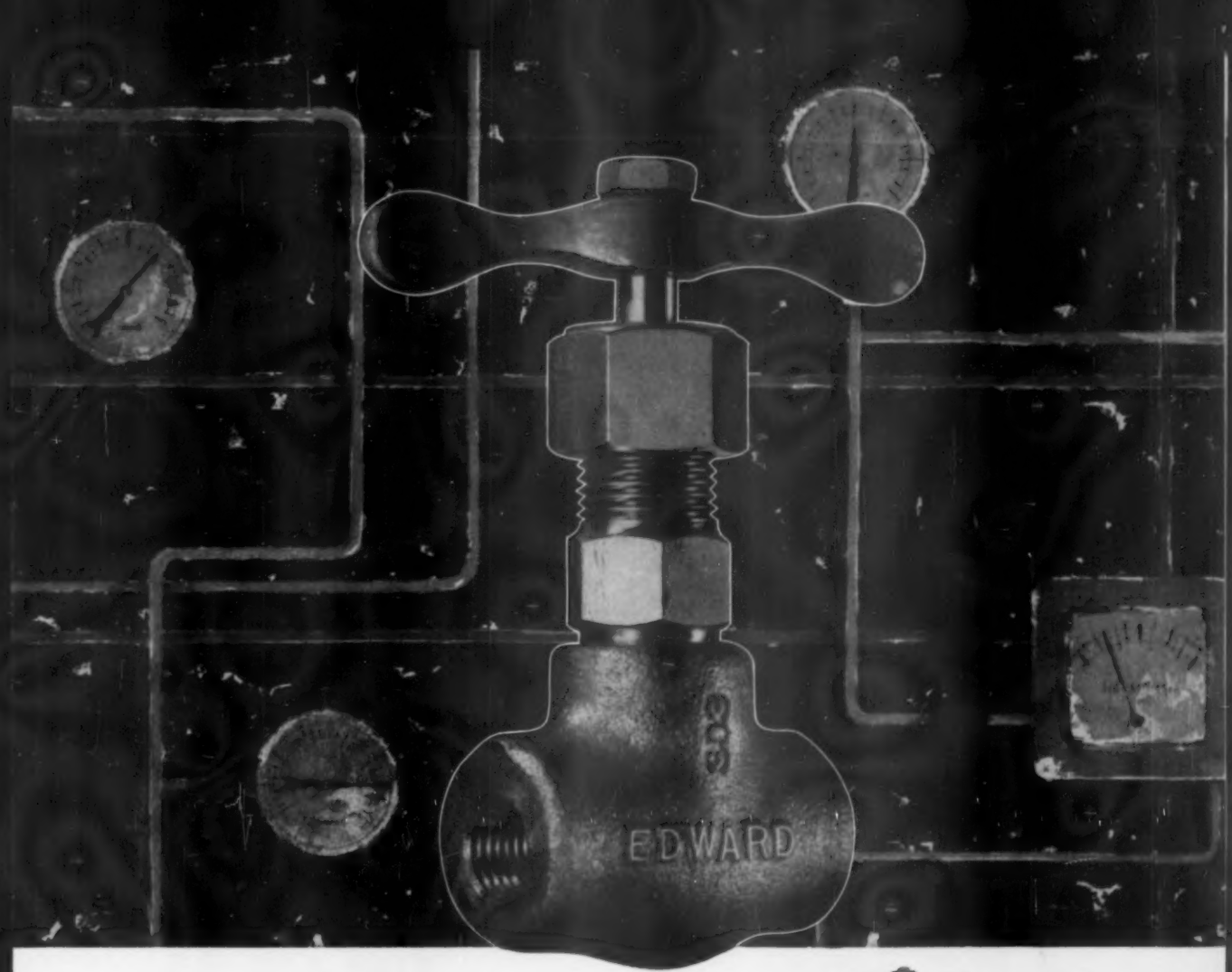

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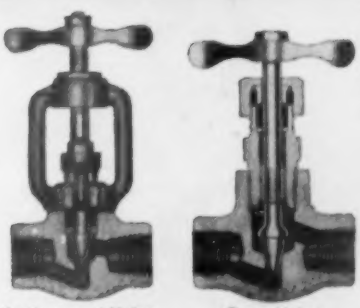

Instrument Valve
Fig. 952 & 2952
6000 lb WOG

Gage Valve
Fig. 152 & 4152
4000 lb WOG

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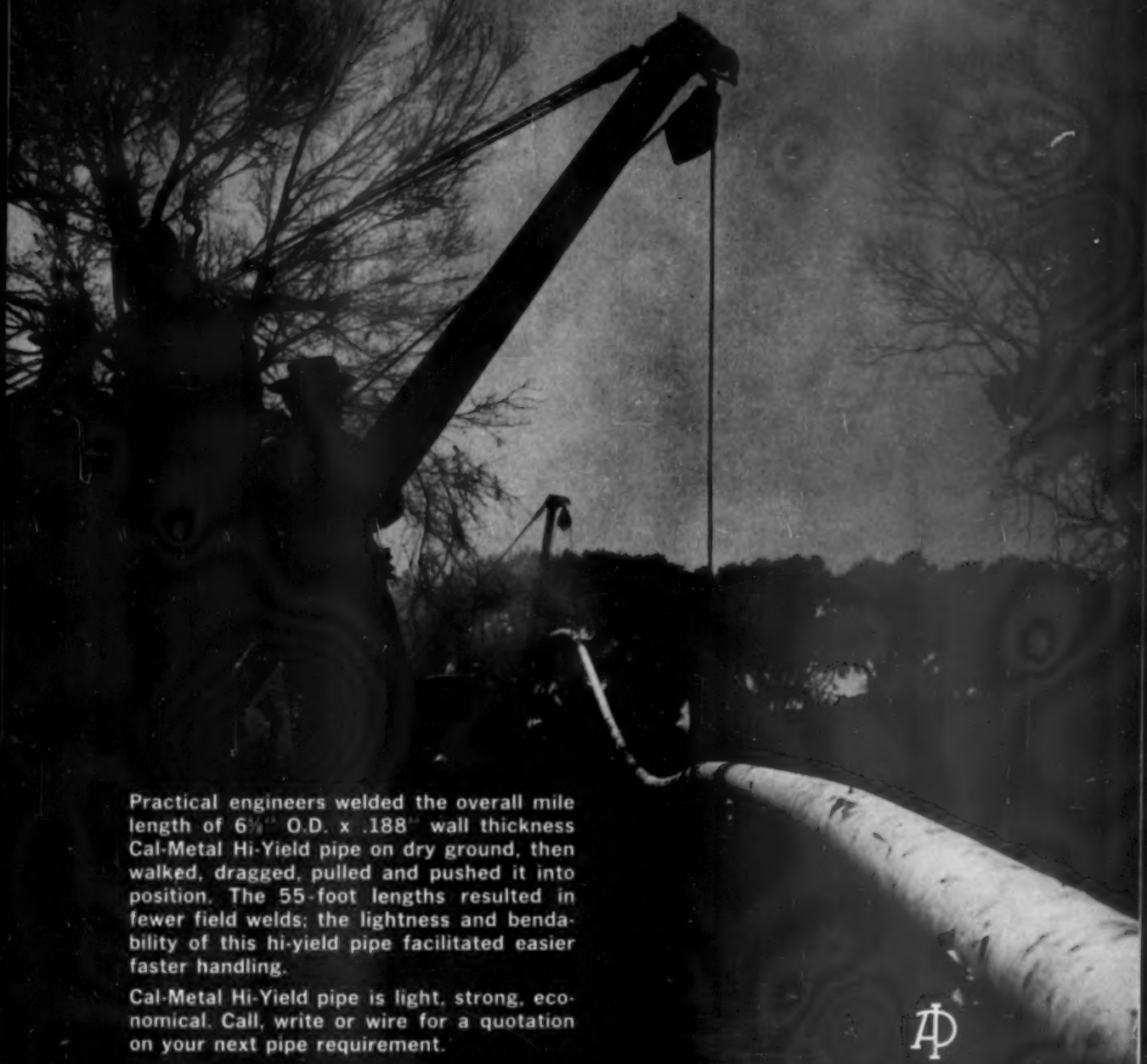

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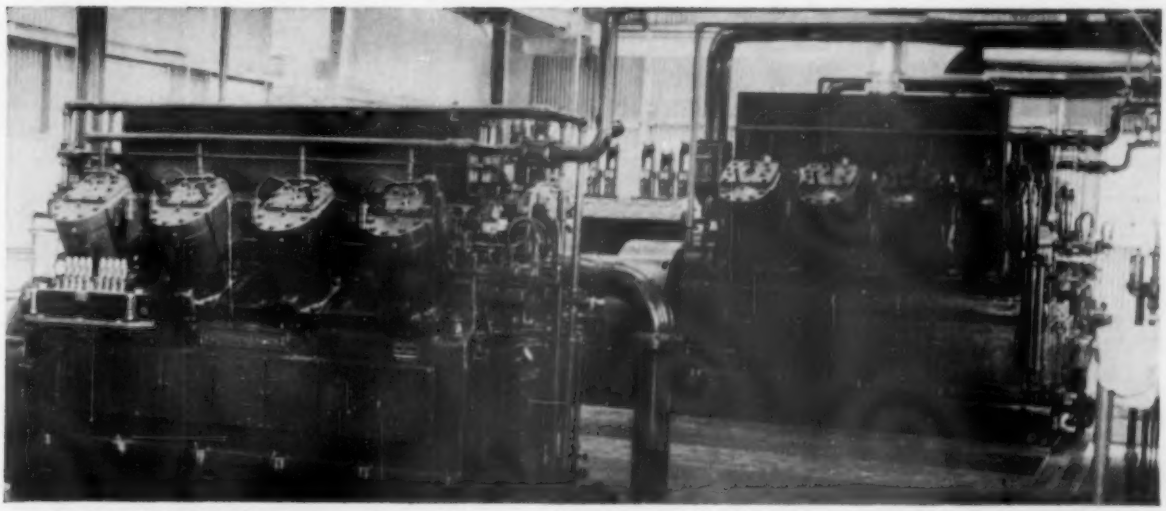

INTEGRAL COMPRESSOR (foreground) is used for gas-lifting water source wells in the unitized turnkey water-pumping plant.

127-million bbl. So far, more than 100-million bbl. of crude have been produced. There are 27 companies in the unit.

The Texas Railroad Commission hearing that started June 16 is expected to result in significant changes in the regulation of future waterfloods and pressure maintenance projects in Texas.

Commissioner William J. Murray, Jr., said before the hearing that the goal of the commission is to give adequate incentives for establishing pressure maintenance systems early in the life of an oil field. The present plan of oil allowables, he said, "may be placing a penalty on those who start waterfloods early."

He added that sound reservoir engineering would provide in most cases for early start of waterflooding, to maintain pressure, rather than waiting until energy is depleted and the field becomes a salvage operation.

Continued research efforts, knowledge gained from experience, and other developments also are contributing to better waterflood programs.

For example, the Texas Petroleum Research Committee, a joint enterprise of the Texas Railroad Commission, Texas A. & M. College, and the University of Texas, has been conducting intensive research into various problems connected with waterfloods and other secondary recovery projects. One recent study, by Nathan T. Cotman, Gerald R. Still, and Paul B. Crawford, shows that the sweep efficiency of the nine-spot pattern may vary from 45% to 90%, compared with 72% for the five-spot pattern, based on studies of model reservoirs. The study shows, too, that there is very little difference in the ultimate oil recovery for the five- or nine-spot pattern.

Treatment of water by chemicals for various waterflood purposes also has been a fertile field for new developments. For instance, one West Texas firm (Rocket Petroleum Co.) has used a new chemical inhibitor which it claims makes possible the waterflooding of bentonitic sands.

The new inhibitor not only prevents hydration of the bentonite but actually dehydrates and shrinks it. Up to now, bentonitic sands have resisted successful waterflood attempts. Should the inhibitor prove itself in succeeding tests, it could lead to new waterfloods in many areas now considered unworkable.

One interesting development is the turnkey construction of a unitized water-pumping facility.

Southwest Industries, Inc., has been constructing prefabricated skid-mounted compressor stations for some time. The company has taken this idea and adapted it to the packaged waterflood station. Such a unit has been built for a major oil company in Willamar West field, Willacy County, Southwest Texas.

A company engineer says, "We incorporated pre-engineered and prefabricated shop construction to pipe up and instrument the pumps, engine drivers, gas compressors for water-source wells, and the like.

"After getting the unit finished and in operation, we invited the oil company's engineers to look over the finished station, and make any design changes or modifications they wanted. We even went so far as to sand blast and paint the required piping in the shop.

"Next, we match-marked all of the parts of the waterflood pumping station, disassembled it, and shipped it to the field. While all this was going on at the shop, we had a field construction superintendent supervising grading, clearing of the site, pouring of concrete piers and slabs for this pumping station. Therefore, when the unit was complete, so was the site.

"Normally, this method takes about one-quarter as long to assemble as a conventional field-constructed waterflood pump station."

He says that the unit will enable an oil company to save from 20% to 40% on total investment, and adds:

"A unitized station is much easier to install than satellite stations. This oil company is using one station to inject water into ten wells, instead of ten stations to pump water into ten wells. The advantages are that the prefab unit saves money and time, and the centralized plant also enables the operator to have central maintenance and operating problems."

continued ▸

OLD BANDWHEELS are discarded like the past in the old Shannon pool, Wyo., where a thermal recovery project has started.

Miscible Floods More Popular

Though waterflooding is and likely will remain the most popular means of secondary recovery, the LPG slug and enriched-gas drive (miscible phase displacement) are rapidly taking hold in several sections of the country.

There are more than 40 miscible phase displacement test projects in various stages of completion throughout the U.S. Many of these can reasonably be expected to become full-scale floods within the next few years. There also are two full-scale LPG injection projects already under way in the country, and a third in Canada. These include the Parks Pennsylvanian unit, operated by Mobil Oil Co. in Midland County, West Texas; and the Central Bisti unit, operated by Sunray Mid-Continent Oil Co. in San Juan County, N.M. (PW—May27'60,p27).

Alberta's unitized miscible-phase pressure-maintenance program, in the North Pembina Cardium unit, is the largest in the world, with an areal extent of some 46,000 acres. Operated by Mobil Oil Co. of Canada, Ltd., it encompasses about 20% of the huge Pembina field.

The advisability of selecting either miscible flooding or waterflooding remains something of a puzzle to many operators.

While there are few questions about the mechanical aspects of miscible flooding, the economic feasibility of the method has yet to be proved to the satisfaction of the entire industry. Large inventories of relatively high-priced commodities (LPG and natural gas) must be tied up for long periods of time. In the final analysis, the economic success or failure of miscible projects depends on nearly complete recovery of the flushing media.

Although borne out in laboratory and pilot experiments, this recovery of injected gas and gas liquids has yet to be proved under reservoir-wide conditions.

Conversely, miscible flooding can normally be expected to recover two to three times the amount of reserves possible with waterflooding (in carefully selected reservoirs), and the possibility of damaging the reservoir through LPG injection is virtually nil.

An example of the differing opinions held on this method is the contrasting decisions reached by operators in the Bisti field. While Sunray Mid-Continent decided on the miscible-phase route in the Central unit, British-American Oil Producing Co., operator of the West Bisti unit, adjoining the Central unit, has chosen waterflooding. Yet both projects have the same objective—to recover additional oil from the Lower Gallup sands—and rock characteristics are essentially the same in each case.

Some answers to the question may result from two combination water-and-miscible-flood projects that will be attempted in Texas.

The Humble division of Humble Oil & Refining Co. plans to inject a mixture of water and enriched gas simultaneously into the Seeligson Zone 21-A pool, Kleberg County, Southwest Texas (PW—Apr.1'60,p17).

In testimony before the Texas Railroad Commission, when seeking approval for the experimental program, Humble engineers said the water and enriched gas drive will enable the company to recover 75% of the original oil in place, compared with an estimated 25% by primary means. The company planned to start operations as soon as commission approval was obtained.

Atlantic Refining Co. is planning a somewhat similar program in its University Block 9 Wolfcamp reservoir, Andrews County, West Texas. The company will inject 225,000 bbl. of propane first, followed by a large volume of injected gas. Then gas and water will be injected simultaneously. The project represents the first attempt to combine the high-pressure gas and miscible-slug processes.

The 5,360-acre block will produce some 17% of the oil in place without aid. Atlantic's V. E. Stepp, chief petroleum engineer, believes the new method will lead to recovery of from 87% to 89% of the oil in place.

continued ▶

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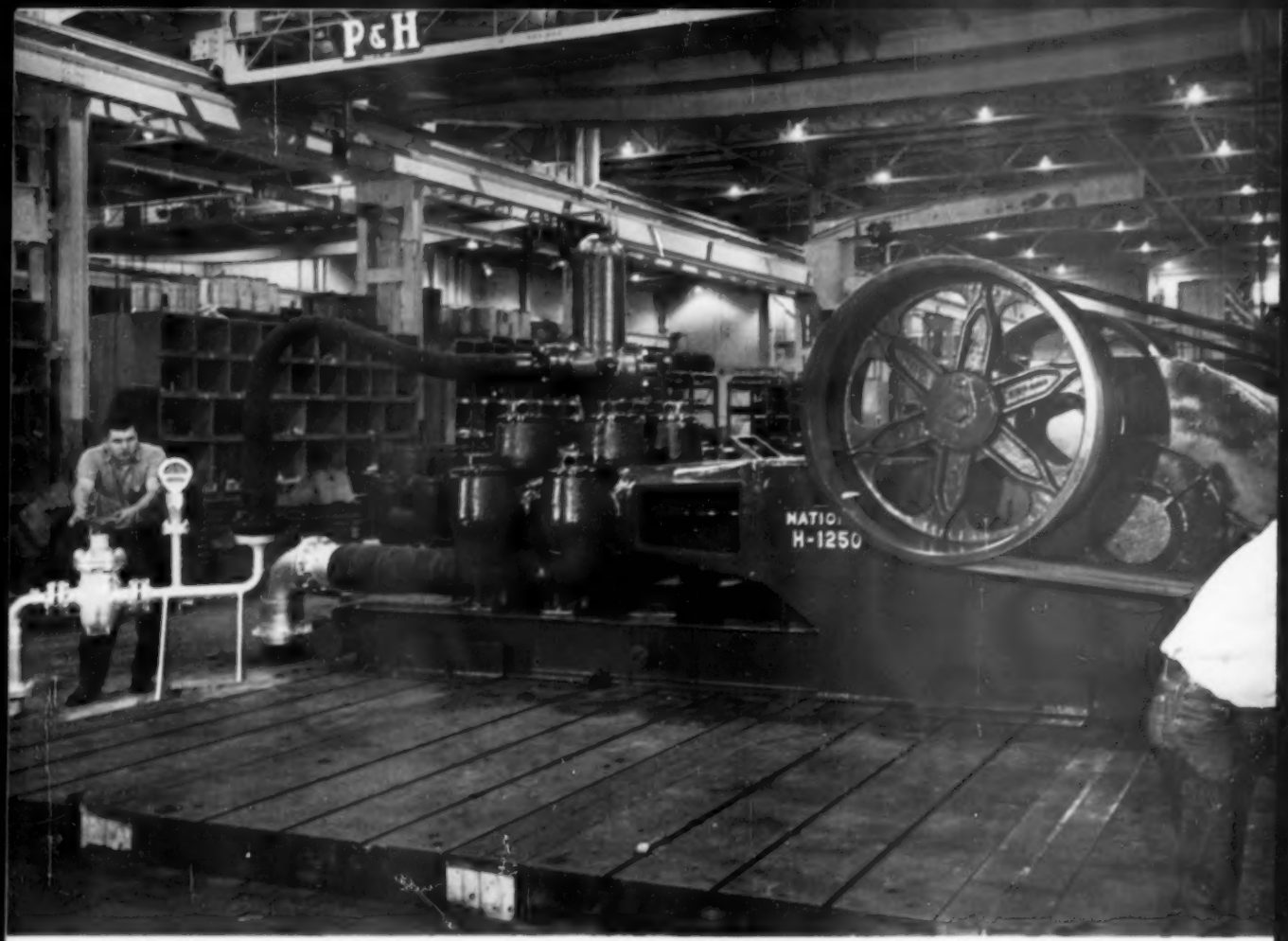
Read about National Supply pump products on next pages

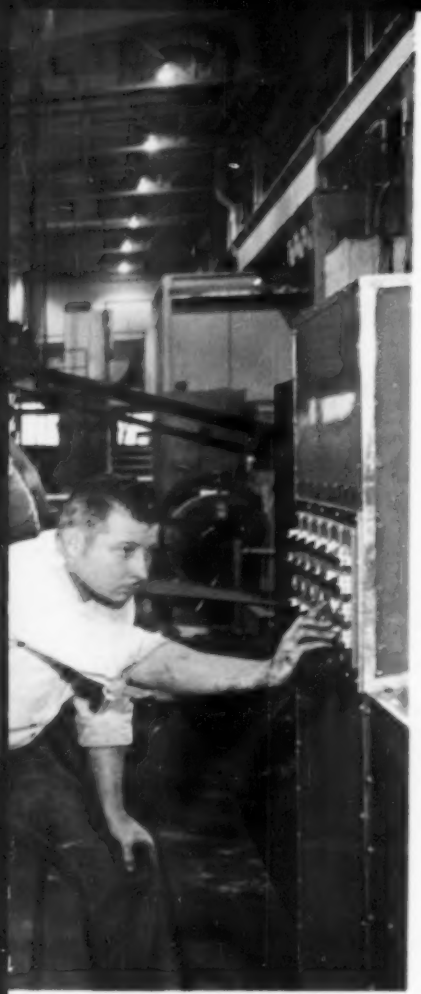


All National pumps are thoroughly inspected and tested before shipment. Photo shows new H-1250 pump undergoing extensive testing at National's Gainesville, Texas, pump test stand. This test stand is capable of transmitting up to 1400 input horsepower.

HOW TO REDUCE MUD SYSTEM

H-1250. National's engineers used new approach in designing power end frame for H-1250 slush pumps. Streamlined, strengthened box-type unit will withstand all pressures of severest service. Unique design features result in reduced cylinder bore wear, longer liner packing service, longer life for connecting rod and main bearings, fast and efficient lubrication.

K-500. This completely new 513 input horsepower slush pump provides a high degree of accessibility which simplifies and speeds up routine maintenance operations. "Fast change" screw type valve covers and threaded cylinder head arrangement permit rapid removal of all fluid end parts, without removing cylinder head body. Write for new Bulletin No. 500.



New National H-1250 Power Slush Pump combines high strength with light weight, compactness

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IMPROVED FATIGUE LIFE. Reduction in cylinder bore stresses is achieved as new design reduces by nearly one half the length of the bore exposed to fluid pressure.

It will pay you to investigate the many new features of National's H-1250 slush pump. Write for Bulletin No. 502, or call your nearest National Supply representative.

Steel

Steel's Symbol of strength, long life, and economy

National Fluid End Parts on next page

COSTS WITH NATIONAL PUMPS

K-700. This new National power slush pump is exceptionally light in weight for the 700 input horsepower rating. Design incorporates same fluid end innovations as the K-500. Fluid end is a one-piece steel casting with streamlined internal passages. Cylindrical sections give maximum strength. Each fluid end is given a thorough hydrostatic test before final assembly. Write for new Bulletin No. 501.

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Careful packaging and shipment of National Fluid End parts assure delivery in factory-perfect condition.

National Fluid End Parts are readily available when and where you need them

National Supply has utilized its facilities and experience as a leading pump manufacturer to develop a complete line of fluid end parts for your use. Every part meets the most exacting quality standards.

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Incorporates two replaceable piston rubbers, forming an inner and outer seal at each end of the piston. Void between the rubbers allows space for displacement, minimizes damage to piston lips as it enters liner. Heavy fabric section molded into the back of inner rubber dams off extrusion around the OD of hub, and reduces pinching of the rubber. Forged steel hub of piston resists expansion under extreme loading.

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Fluid pressure actuates the sealing lips. The greater the pressure, the tighter the seal . . . yet the solid make-up through the body of the packing minimizes the danger of overtightening it when it is installed. Rod wear is sharply reduced, because lip pressure is never excessive . . . in fact, it is negligible on the suction stroke.

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Stepp says the method represents an effort to combine the good qualities of both waterflood and miscible displacement. He says water has a great advantage in that it has an efficient sweep, though its unit displacement is low. With a miscible slug, the unit displacement is 100%, but its sweep is poor.

Stepp adds: "We are intensifying our efforts to make use of all applicable secondary recovery processes. There are a number of processes (as many as a half dozen) under investigation. Application is largely a matter of economics relating to cost of injection materials and to the allowable rates. Water costs about 2¢ per bbl; propane costs about $2 per bbl. It is, therefore, difficult to justify more expensive recovery methods without an allowable system that relates the creation of reserves to allowables."

Other Methods Make News

The first carbonated-water flood has produced some eye-opening results in Oklahoma. Two new projects have already been started—one adjacent to the original project area, and the other in Kansas.

Oil Recovery Corp., which originated the patented Orco process, completed the final stage of carbonation on Apr. 27 this year in the 240-acre K&S project area, Washington County (PW—Jun.19'59,p57). Water injection was started in February, 1958, and carbon-dioxide injection started in April of the same year.

As of May 1, this year, total oil produced by Oil Recovery Corp.—operating the project jointly with Wellsville Oil Co.—was 810,000 bbl. in the little more than two years since the company began its test of the Orco process. This is nearly 300,000 bbl. more than the previous combined cumulative primary and waterflood production in 35 years, dating from 1905. The field was out of production between 1934 and 1951. An economic study of the process will be released shortly.

Oil Recovery has started a similar project in the adjoining 240-acre Post Oak tract. The company also has started tertiary pilot operations on a 1,200-acre tract just east of Chanute, Neosha County, Kan.

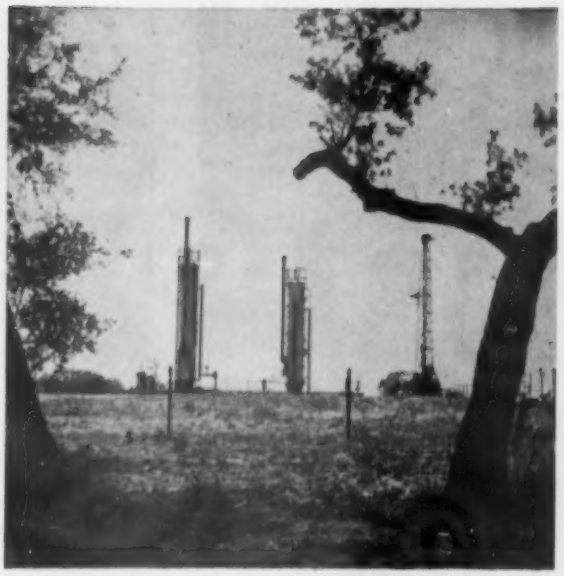
In California, Shell Oil Co. has initiated a pilot test to steam-heat an oil zone in the Yorba Linda pool.

The company hopes to increase production by heating heavy crude (about 12-gravity) so that it will flow. The crude is of such type that a relatively moderate increase in temperature markedly decreases its viscosity. A shallow zone at about 600 ft. has been selected for the test.

During the test, Shell will attempt to force oil away from an input well toward other wells. It's expected that the test will take a considerable period of time and cost as much as $150,000. Laboratory tests using the steam heating method were sufficiently encouraging, however, to warrant the pilot program. Should the pilot prove successful, full-scale operation of a similar type of recovery may be attempted. But, says a company spokesman, such an operation is at least several years in the future.

The use of an electric heater to stimulate well production, fairly common in California, is being tested again in Oklahoma.

Tejas Petroleum Engineers & Laboratory has a pilot test under way on one of its leases in Oklahoma. Phil White, of Tejas, says the method has been tried by only a few companies in the Mid-Continent area. Two main objections to its use, he says, are: (1) cost of the heaters, and (2) breakdowns on installations.



CENTRALIZED BATTERY is being installed in Person field, Tex., as Shell Oil Co. proceeds with "look-ahead" concept, while early development drilling (background) continues.

White says Tejas is using a new type of heater (made by E. L. Weigand Co.) that can be installed for about $1,000, on the average. He adds that the low-priced unit has been on test for three months so far, looks good, but will have to be tested for a longer period.

Thermal recovery (in-situ combustion) also is being conducted on a test basis in various sections of the U.S.

Right now, at least three such tests are under way in Texas, one in Wyoming, one in Kentucky, about five in California, one in Oklahoma, and one in Kansas.

Tejas' White says all of these projects would still have to be classified as in the test or evaluation stage. He believes work so far has solved most of the basic problems involved in the method, though individual reservoirs and formations have problems of their own.

He adds, "The biggest problem today in furthering work of this kind is 'who the hell needs the oil.'" White says the problem of corrosion isn't as serious as some had thought.

'Look-Ahead' Concept Grows

One of the most significant new trends that is now developing in production might well be labeled the "look-ahead concept." It involves complete planning for a field—right on through to centralized production facilities—from the time a discovery is completed.

While this concept may have been, and probably was, used in isolated instances in the past, it is only in recent months that it has developed into a definite, discernible trend. The concept is important to operators because it can lead to big savings and better recovery.

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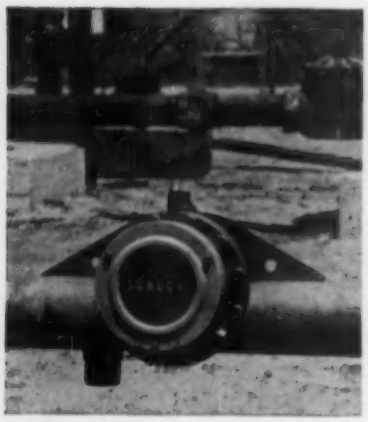
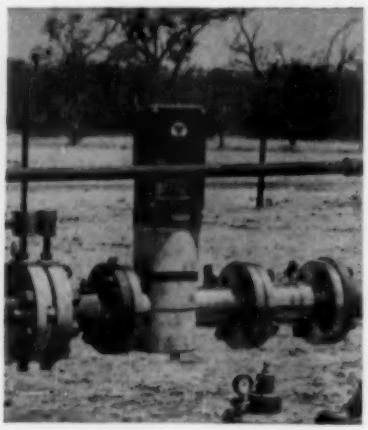

VARIOUS TYPES of direct-reading lease gas meters (there are two in center picture) are being tested by Shell in Person field.

Here's what the concept involves: Instead of developing a field in the customary manner, establishing lease production facilities on each individual lease—only to come back later and institute centralized production programs at a higher total cost and scrapping or adapting much of the original equipment—the operators now thinking along these lines are putting in the centralized setup progressively, as the field develops. When development is complete, the whole setup is in being.

Not only are there savings on the equipment side, but there is less waste due to vaporization from the start; less maintenance, because of fewer tanks; more efficient production, because of earlier automation; and other benefits.

One example of this concept is Shell Oil Co.'s operation in Person field, Karnes County, Southwest Texas.

Shell asked the Texas Railroad Commission for approval to install centralized production facilities, including an automatic custody transfer system to serve several leases, shortly after it drilled its first well in the field last November.

The system would include the metering of production off the lease on which it is produced; the commingling of multiple royalty interest oils into a common battery; and allocation of production on the basis of meter readings. ACT would be installed as well as common test facilities to serve more than one lease.

Production from each lease connected to a central battery would be metered at the central location in volume-type dump meters after the removal of basic sediment and water. The pipeline oil would then be commingled and transferred to the pipeline or tank truck through an ACT system. Shell assured the commission that the system will provide adequate safeguards for the correct testing and measurement of individual lease production before it enters common storage and loses its identity.

Approval was granted, and Shell proceeded with its look-ahead field-development program. Shell expects to complete between 20 and 25 wells in the field, eventually. The company already has completed eight wells, and is drilling another.

Shell's program is flexible, and subject to some change as the actual development proceeds.

The company plans to produce all the wells into four central batteries, one eventually serving seven leases; another handling two leases; the third to handle three to five leases; and the fourth to serve three leases. Each of the four central batteries would be equipped with ACT.

The first two central batteries have been installed already. But no ACT or automatic well-testing equipment has yet been set up. That will come later, when the volume of production warrants.

Had Shell taken the individual lease route in developing the field, it would have been necessary—provided the basic assumptions on the ultimate limits of the field, and so on, were correct—to install at least 20 tank batteries, each with its own normal production equipment and each with its own gas-gathering line.

In contrast, by following the new concept, Shell will install a maximum of four central batteries (possibly fewer) and will be able to scale down the necessary equipment all the way down the line. Some of the leases will be of the one-well variety, which would have aggravated the installation and maintenance expense still more, had the usual development program been followed.

Other savings will result from reduced operating and labor costs; an increase in reserves from reduced vapor and tank-bottom losses; reduced bookkeeping costs; and the existence of an already-built single gas-gathering system which could be used, eventually, as a return route for gas utilized in a gas-lift system.

Another example is what Sun Oil Co. calls its "consolidation" program in the McComb pool, Pike County, Miss.

Like Shell, Sun began from the start to incorporate a centralized production system into its field development program. In addition to the normal incentives for this course, Sun has several small-tract leases in the field. The installation of individual production facilities on each lease would have been quite expensive, contrasted to the cost of a centralized system.

Based on an estimate that there would be some 35 Sun wells in the field, about 30 tank batteries would have been required under individual-lease procedure. But by consolidating production from the various leases, Sun is reducing the number to five.

Comparing the difference in costs, including tankage,

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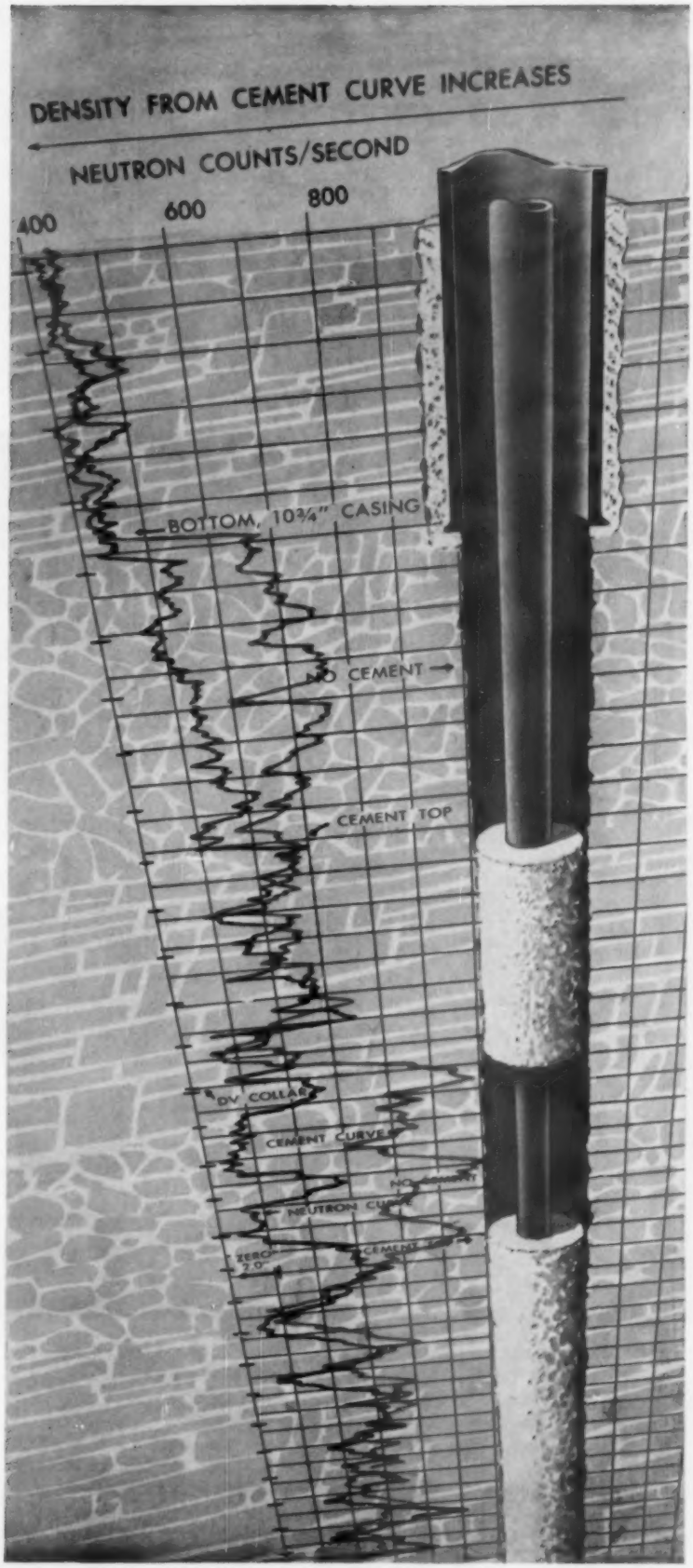

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The Cement Log shown at the left is made up of sections of an actual log run in 5½" OD casing from 3800' to surface. All information shown is exactly as it appeared on the original log.

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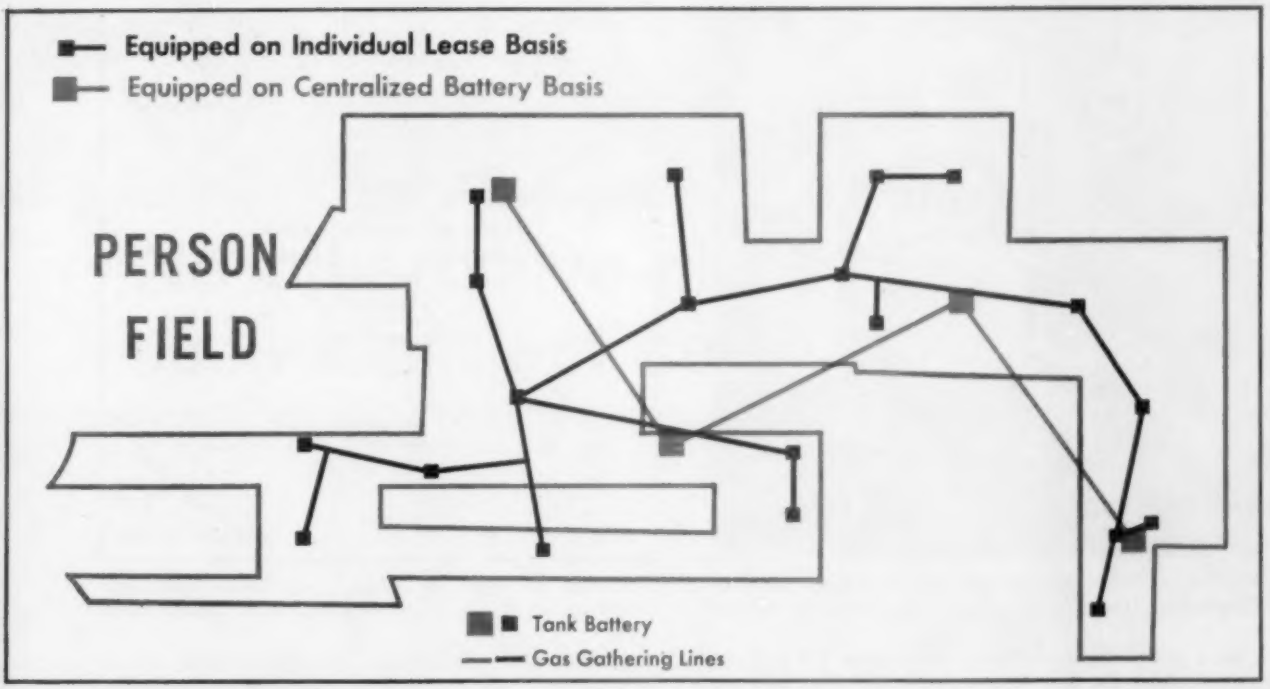

FIELD EQUIPMENT needs will be cut heavily by Shell in Person field through early installation of centralized batteries.

valves and connections, labor, and the like, and allowing for the cost of installing commingling facilities, Sun will save in excess of $100,000 in out-of-pocket expenses alone. To be added to that are the various accumulative savings from the retention of more of the lighter ends, and in maintenance, supervision, and so on.

There is no way of computing, at the moment, just what the total savings will be. But just as an indication, on an industry-wide basis the accepted figure for upkeep and maintenance on a tank battery is about $500 annually. On the individual-lease basis, Sun's cost would amount to about $15,000 per year. It costs a bit more to maintain a consolidated battery. But by trimming the total number of such to five, instead of 30, Sun probably will save at least $10,000 annually on this alone.

And the savings tend to multiply. The gas-gathering system savings, again, will be substantial, because the lines will have to be laid to only five batteries, instead of 30. And by installing ACT, Sun will be able to eliminate a great deal of tankage that would otherwise be necessary.

The real significance of planning a centralized, fully-automated production program from the start in a new field is the fact that, when all factors are balanced out, this setup costs about the same as individual, manual systems installed as fields are developed. The centralized system, however, will net the company a substantially greater payout over the life of the field.

The key to success is planning ahead, with the various components installed progressively, as needed.

Here is a hypothetical example based on composite economic studies, and not reflecting an actual case, showing how forward planning can trim costs, assuming some 20 individual leases are involved:

Individual lease method, without automation: Basic installation, $432,000; gas-gathering system, $63,000; total $495,000.

Individual lease method, with automation: Basic installation, $432,000; ACT, $60,000; automatic well testing, $46,000; gas-gathering system, $63,000; total, $601,000.

Centralized method, with automation: Basic installation, $454,000; automatic well testing, $12,000; gas-gathering system, $30,000; total, $496,000.

The economic margin in favor of advance planning in the installation of facilities widens even further when some of the other factors are considered. In the hypothetical field, for example, the centralized system would save something like $30,000 per year in operating, labor, and transportation expenses, or about $450,000 over an assumed life span of 15 years.

This, along with the other savings, would enable an operator with a centralized, automated system to net a payout in 1½ years. And with newer, more efficient automatic devices and facilities being developed, the savings over the individual-lease, manual system will be even greater.

Another example of the trend toward a coordinated A-to-Z approach in production is the program recently instituted by Tekoil Corp. to adapt promising methods of secondary recovery to specific reservoirs.

The program will be directed by Norris Johnston, of Petroleum Technologists, a Tekoil subsidiary. This type of approach isn't foreign to major, integrated oil companies, but smaller operators customarily attempt to solve specific problems as they arise, rather than try to work out over-all solutions which can be adapted to individual problems.

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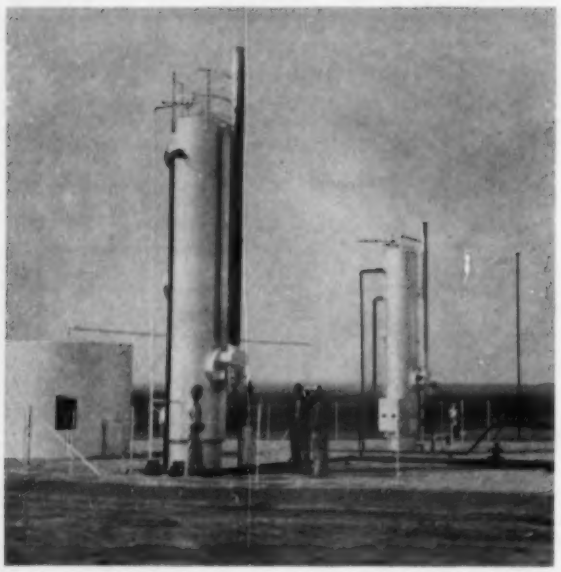
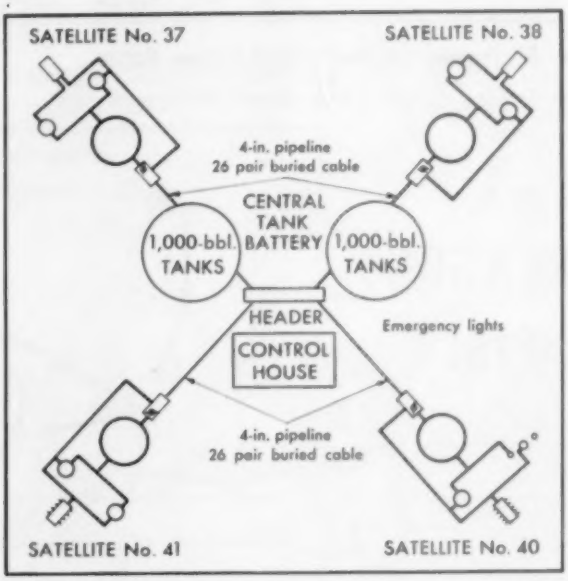


SINGLE-SECTION SATELLITE on Continental Oil Co.'s Chittim Ranch lease, Tex., has facilities and header for 16 wells.



GENERAL LAYOUT shows how four-section automated unit is laid out on Conoco's Chittim Ranch lease, Sacatosa field.

As a practical matter, the Tekoil program will probably go something like this: Petroleum Technologists will conduct basic research and testing of various methods and techniques, attempting to determine how promising each is, and under what conditions it is most effective.

Then it will endeavor to translate these findings into terms of specific properties held by Tekoil—in other words, to fit a given reservoir with the most suitable recovery mechanism.

In addition to this evaluation and recommendation function, Petroleum Technologists will follow the project into the field to advise and guide the operating personnel on the most effective way to apply the method.

An additional indicator of this type of thinking is the prediction of one major company production engineer that future oil fields in the Houston area will be developed with block stations scattered on several leases. These stations will test wells and meter emulsions into central treating and custody transfer installations.

He believes that savings on the order of one-third are expected in the costs for surface facilities, along with several operating advantages.

Such a system, he notes, permits efficient layout of trunk lines and satellites, even though predictions of productive acreage are changed drastically at different stages of field development. For flexibility, several, if not all, of the lease-metering and well-treating facilities should be skid-mounted and prepiped.

Approval by the Texas Railroad Commission of metering of emulsion and the use of joint well-test facilities for several leases, he adds, would further enhance such programs. The well-test facilities would be equipped with suitable interlocked valves to insure that production from one lease would not be diverted through any other lease meter.

In addition to the usual savings resulting from such operation—in tankage, bookkeeping, and the like—other savings would accrue to pipeline companies. Capital costs for gathering systems, for example, are reduced greatly. Wide application would eventually reduce pipeline gathering charges, which are held to a fixed percentage of costs. This could then result in a higher price per barrel to the producer, the spokesman hopes.

This operating method, he adds, opens a possibility of unitizing almost all surface facilities in a field while still permitting each operator to retain full control of production from his properties, thus skirting arguments most frequently brought against unit proposals; namely, productive capacity of wells, sand thicknesses, productive acreage, and the like.

Automation Uses Expanding

The metering of emulsions—oil, water, and bs&w—as a common production practice is on the horizon. This is the significant aspect of the Shell Oil Co. ACT system in the Pearl Queen pool, Lea County, N.M.

This automatic system of mingling emulsions from several leases is believed to be the only one of its kind in the country. It has been operating for two years, with no difficulties reported—a fact which operators in other states hope will lead to relaxation of rules against such commingling in their areas.

There are 21 leases and 43 wells in the project, which produces about 33,000 bbl. of oil per month. All wells produce from the Queen sand, except one, an Atoka completion made about six months ago. All but two of the 43 wells are automatic. A test-data system is semiautomatic, and most of the wells are on artificial lift.

While production is commingled prior to treating, samplers are located downstream from the production separators. In testimony before the New Mexico Oil Conservation Commission, Shell said:

"The volume of sample taken is directly proportional to

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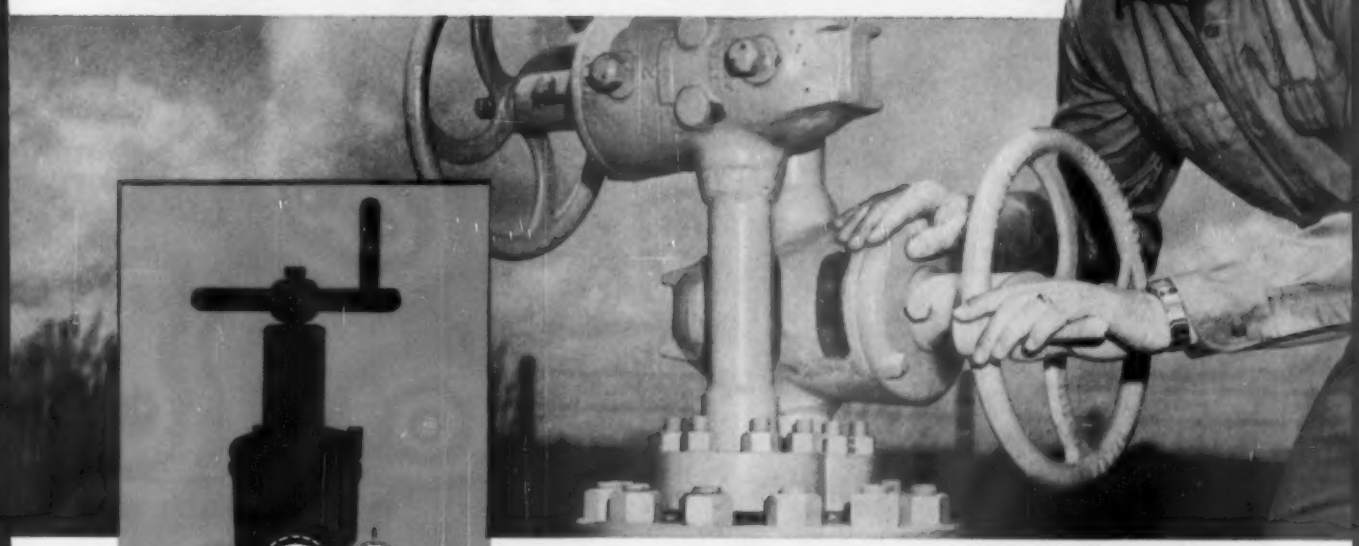
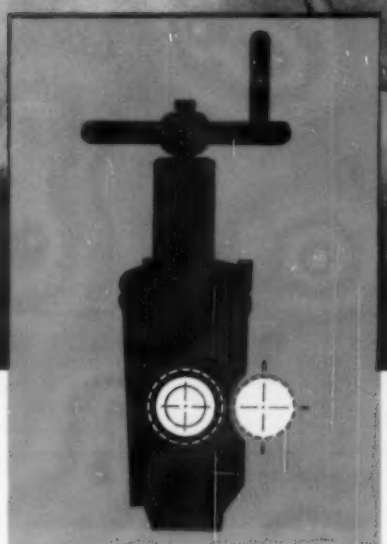
"No other valve gives such a perfect seal"





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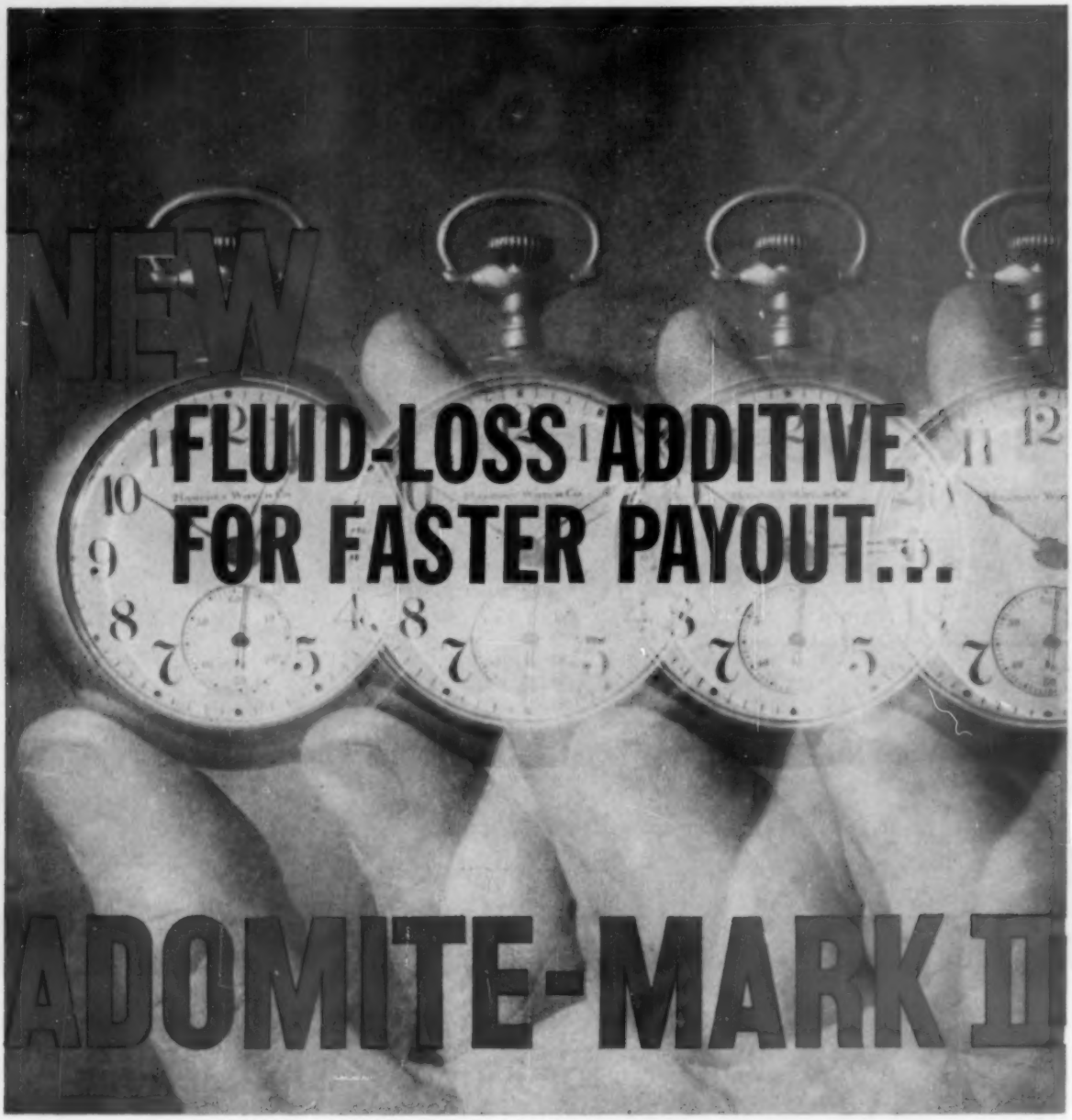

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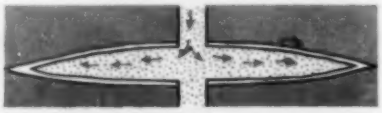
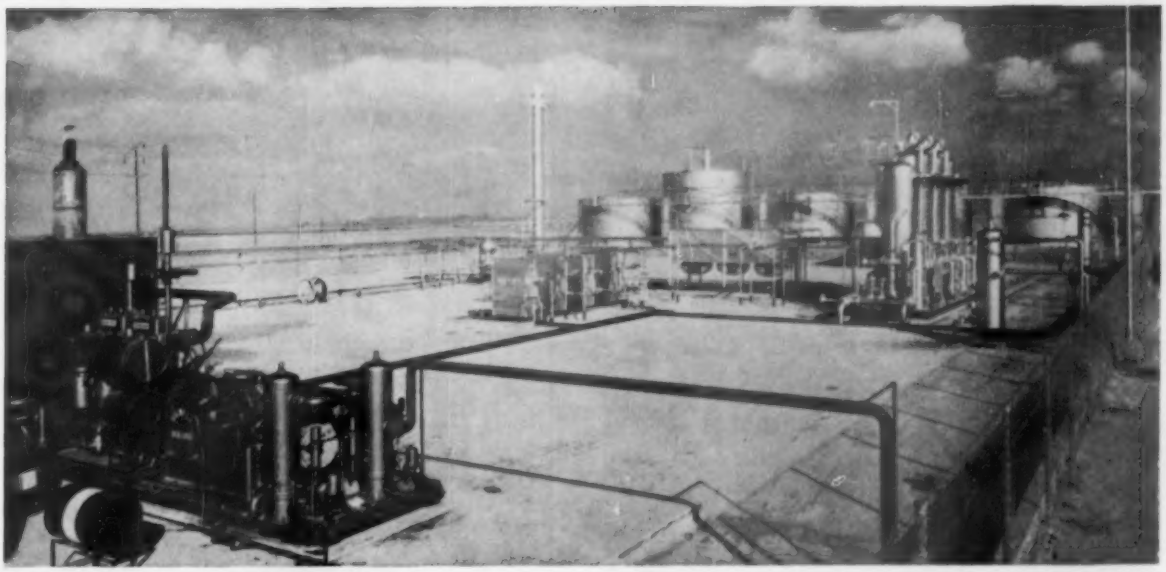
ADOMITE®  *. . . fluid-loss additives*



DRY-DESICCANT TYPE natural gasoline plant has just been installed by Reserve Oil & Gas Co. in North Tejon field, Calif.

the production from the lease, and is used to determine the average gravity and bs&w content of the lease production."

There are one central and three remote facilities for metering emulsions. Each well is tested once each month, and each lease, at various times, is metered. The semiautomatic test-data system at the central location prints out the time, date, total barrels of fluid, and net oil and gas, as wells are separately tested.

Because of a high percentage of water (30% to 70%) a free-water knockout system was installed to dispose of most of the water prior to metering.

Then fluid from the leases is metered periodically for gas measurement, and temperature-compensated positive-displacement meters measure total fluids, with cuts of 10% to 15% water. A proportional sample of the fluid is also taken at intervals, and once each month shakeouts of this are made to determine the percentage of water.

From this point, fluid from all leases is mixed and treated (heated), then sent to ACT from this central storage point.

Centralized, self-regulated production facilities placed in operation in Alberta's big Pembina field last winter also are proving highly satisfactory so far.

H. L. Brusset and C. A. Y. Shephard, Mobil Oil of Canada engineers, say the facilities are "safer, more reliable, and more economical in operation than the standard manual system. The possibility of human error, particularly in the recording of data, has been virtually eliminated." They add that measuring instruments are reliable and accurate and, once calibrated, free of all gross errors.

In the Pembina field, they add, pressure maintenance by waterflooding made consideration of wet-crude dehydration and disposal of the produced water mandatory. Crude dehydration and treatment and disposal of produced water, as well as the sale of gas and crude, were expected to be handled more efficiently at one central point than at several conventional batteries.

The plan was effected by routing the produced fluids to the central station by way of several well-testing batteries (satellites). The entire system—involving 40 producing wells—was made self-regulating.

One relatively new device, a capacitance measure, is being used by Mobil at Pembina. As used in this instrument, capacitance is a measure of the percentage of water content of oil-water mixture.

A Mobil spokesman told PETROLEUM WEEK that the advantage of the device is that physical samplings are not necessary. As a result, he said, "there is the same accuracy with less investment in equipment." He added that the investment was about one-third less, roughly $2,000 compared with $6,500.

Mobil also installed a vapor-recovery system, after a study showed that an average of 450,000 cu. ft. of gas, containing 4.75 gal. of liquids per Mcf., were being vented at the shipping tank. At current prices, the lost vapors were valued at about $50,000 annually. The vapor-recovery system cost between $30,000 and $40,000, leading to an attractive payout.

Gains Mark Lease Processing

The upsurge in gas production has seen a corollary growth in new lease-processing facilities, many of them automatic.

Solid-desiccant hydrocarbon adsorption recovery units, for instance, are being put into growing use for field dehydration and processing of high-pressure gas streams. Developed only recently, these units provide a method for recovering hydrocarbons from many gas wells previously considered too small or too lean for economic processing. The units are fully automatic and fit in with lease-type operations in that they require only periodic checks by the operator.

Shell's R. C. Visser and H. W. DeYarmett made a study of such units and concluded that attractive payouts can be

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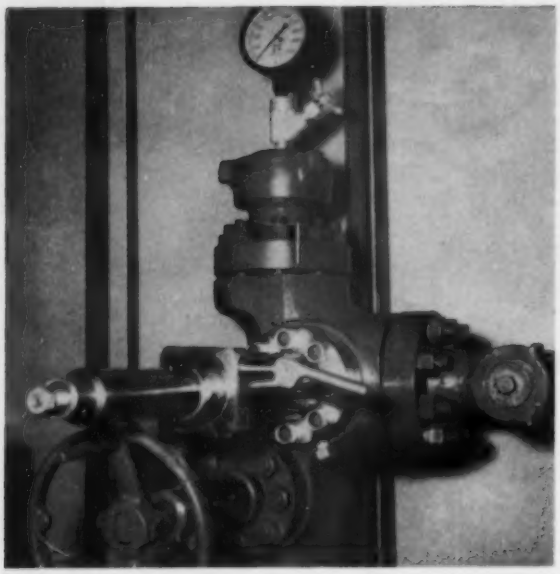


AUTOMATIC SAFETY VALVE, made by Cameron Iron Works, is shown installed on wing of solid-block tree valve.

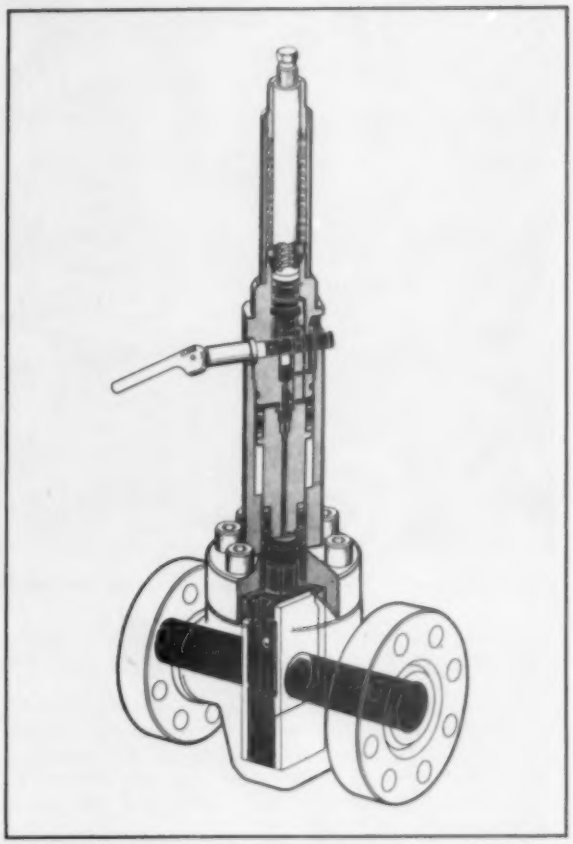
realized if the units are properly applied and operated. But, they cautioned, application in general should be limited to small, lean-gas streams.

Similar conclusions have been made by Angus R. S. Leitch, of Barry & Richardson, Calgary. Leitch compared performance of some recently installed desiccant units with refrigerated gas units for similar service. "It was found," he reported, "that for lean gases, and at low flow, the desiccant units were often competitive or were less expensive than a refrigerated unit for the same purpose. As the throughput increased, or with a richer gas, the cost of installation for a solid-desiccant unit approached and exceeded that for the equivalent refrigeration unit."

Leitch concluded that, generally, "it is agreed that hydrocarbon recovery by solid-desiccant adsorption requires less operating expense than other processing means, because it is easily adaptable to automatic operation. Where other functioning equipment requires the presence of an operator, this advantage is lost."

In California, Reserve Oil & Gas Co. has installed a dry-desiccant type natural gasoline extraction plant at North Tejon field. The unit, first of its kind on the West Coast, is a Parkersburg Rig & Reel Co. Dynamic Adsorption unit, using a bead-form activated silica gel for the desiccating medium.

The plant, which also lends itself to automatic, unattended operation, is designed to remove vapor-state hydrocarbons from natural gas produced in the area. It has a capacity of 30-million to 35-million cf/d. The plant can be expanded by the addition of step-wise components. For example, another set of adsorption towers can be installed, paralleling those existing, to double extraction capacity. Further cooling and refrigeration components would facilitate the condensing capacity of the higher boiling-point liquids. By controlling cycle length and regeneration rate, the plant can be made to extract products ranging from gasoline with a Reid vapor pressure of 20 to LPG or even pure propane.



SCHEMATIC CROSS SECTION of Cameron's automatic safety valve is shown in automatic "normal" position.

Completion Methods Evolve

More emphasis is being given to completion methods as a way of cutting over-all production costs. Most interest currently centers on tubingless and multiple completions.

So far as tubingless completions are concerned, a spokesman for one Southwest major says: "Our company is really emphasizing tubingless completions now. The only difference in our approach now, as opposed to when we started, is that in multiple tubingless completions the company now runs strings independently instead of strapping them together as we first did.

"My outfit found the over-all average cost of tubingless completions to be 20% less than normal, or conventional, completion methods. Most of our tubingless completions so far have been in shallow wells. We are not afraid of deeper wells, but we want to be on firm ground from the standpoint of technology and experience. Actually, we feel we could drill and produce a 20,000-ft. tubingless completion well if we wanted to."

Atlantic Refining Co. has prepared a comprehensive report that provides application criteria for tubingless completions. Here are some of the conclusions listed in

continued ▸

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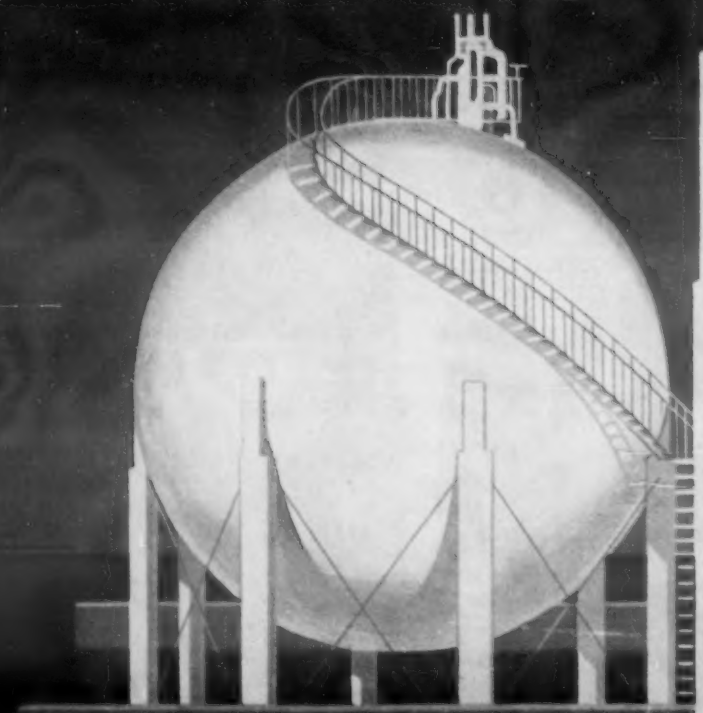

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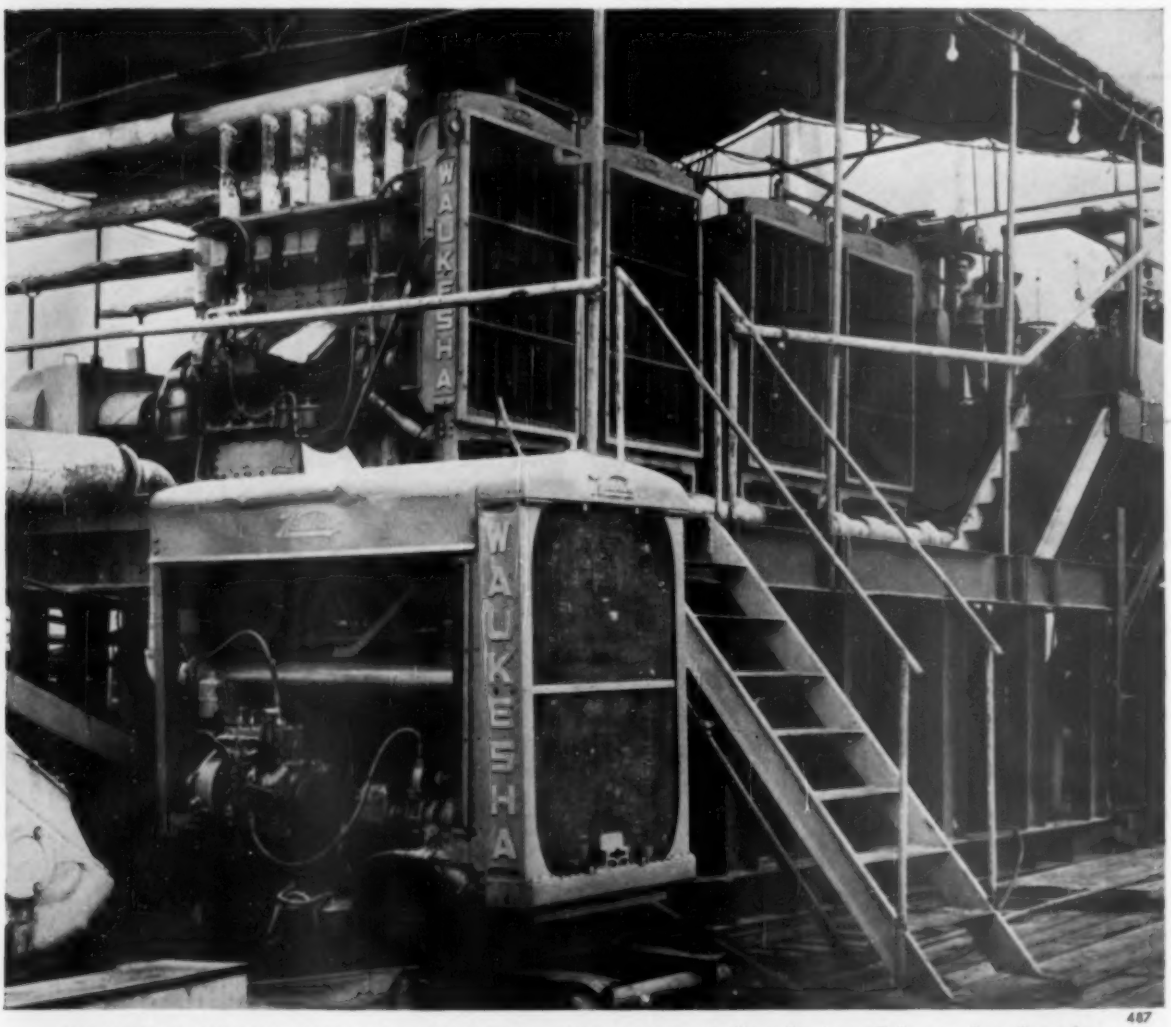
The STANDOUTS—in any oil field, on any job—are always Waukeshas! Here, for instance—at Groves, Texas (near Beaumont) on Rig 4 of the Meredith Drilling Co. of Houston, Texas—are four 1905 cu. in., 7 x 8¼-in. NKRBU Waukesha gas power units on the platform; and down below a 1197 cu. in., 6¼ x 6½-in. WAKU Waukesha gas power unit. The driller, H. E. Offutt says these Waukeshas have worked constantly for years with no major repairs. It's that way *all over the oil fields.* Reliability is only one big reason why Waukeshas dominate. Diesel, LPG, natural gas, gasoline—to 1235 hp. Get Bulletin 1079.



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WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / **New York • Tulsa • Los Angeles**
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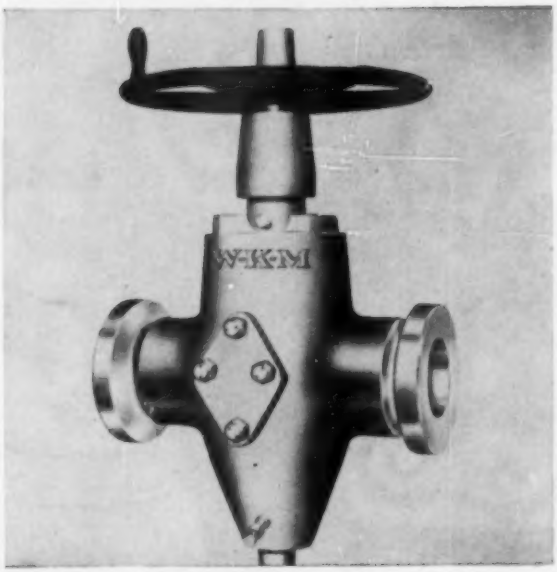

HIGH-PRESSURE VALVE just developed by W-K-M is rated for 20,000 lb. working pressure and 40,000 lb. test pressure.

SAND-LADEN JET STREAM in Dowell's 'Abrasijet' is used to perforate, cut casing, or clean pay faces.

the report, which has been distributed to company engineers:

- The tubingless technique has been successfully developed to the point where it is a sound completion method where applicable.
- Because of the limitations imposed on producing and remedial operations, the method is applicable only in areas where reservoir characteristics are known.
- Triple and quadruple tubingless completions are especially attractive, as they eliminate the use of expensive casing and in-hole equipment that is required in multiple completions within one well bore.
- In general, the tubingless completion technique is applicable to the following single-zone and multiple-zone completions: (1) 5,000-ft. or shallower oil wells; and (2) 3,000-psi. or less (shut-in surface pressure) gas wells.

There has been expanded use, too, of slim-hole completions for developing both primary and secondary recovery.

Jack Hinckley, of Stckoil Petroleum Corp. says that "on a carefully planned secondary development program utilizing slim-hole completions (not to be confused with slim-hole drilling), it is safe to assume that over-all savings of as much as 25% on producing wells and 30% on injection wells can reasonably be expected."

Hinckley adds that techniques and equipment have now been developed which make it possible to use 2⅞-in., or smaller, casing in completing the majority of wells now being drilled. "As additional operators realize that this more economical method of well completion is time-proven and need not be limited to 'special situations,' its usage will continue to increase," he says.

This method differs from tubingless completions in that, while 2⅞-in. tubing is used as casing, 1-in. tubing is used as the producing string.

The recent quintuple and sextuple completions—the industry's first—have focussed attention on multiple completions as a major approach to cost-cutting and more efficient recovery.

Sunray Mid-Continent Oil Co.'s sextuple in Laward gas field, Jackson County, Southwest Texas, holds particular significance for the industry in that it demonstrates the practicability of producing thin, relatively unproductive sands (PW—May27'60,p24).

All six sands, produced through three concentric strings of 1½-in. tubing within 2⅞-in. tubing, cemented in open hole, produced a total of only 2,770,000 cf/d. This is enough, however, to make the operation commercially feasible, whereas such would hardly have been the case for any of the individual zones.

A cost study prepared by Sunray shows that the profit-to-investment ratio for its sextuple is about 25 times that of six conventional single completions in the field. The company reported a total cost of $75,314 for its sextuple, compared with $304,104 required to make six single completions in the same field. Profit-to-investment ratio of the six singles is estimated at only 0.15, whereas for the sextuple, really a triple dual-completion, it is 3.71.

Sinclair Oil & Gas Co.'s quintuple completion off Louisiana, a prolific producer, is a classic example of how new tools and techniques can be adapted to special situations.

Most industry emphasis, however, will continue to be on dual and triple completions, which are more widely applicable.

Even the triple completion is still relatively rare, with most of them to date being centered in the Gulf Coast area, and a handful in California.

The first triple completed in the Rocky Mountain area, the Johnston-Shear No. 1-4 Jicarilla, Rio Arriba County, N.M., was completed only a few months ago. But the economics of that triple indicate that more can be expected in that area.

continued ▸

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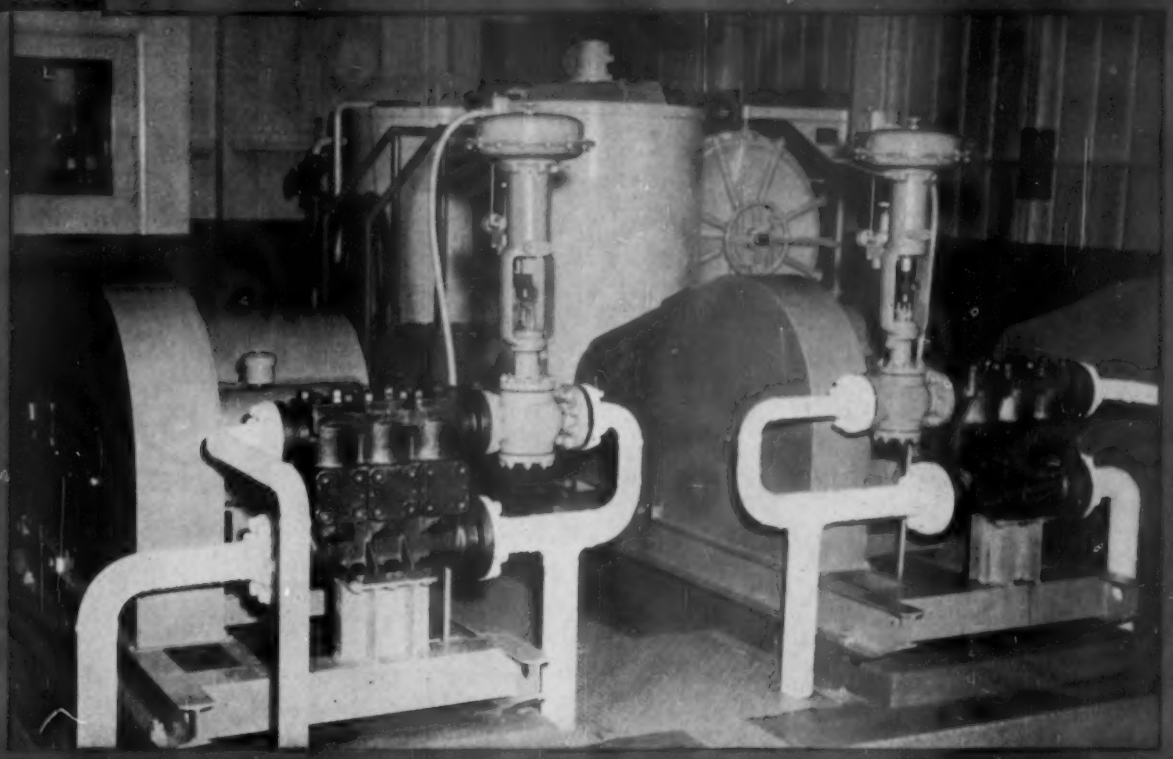
WHAT'S BACK OF GASO LEADERSHIP IN

WATER FLOODING?



There's a Single-Word Answer: PERFORMANCE

The photograph shows one of a steadily mounting number of Gaso installations in water flooding service.

The injection pumps (3) are Fig. 3365, 1¾" x 3" Gaso Horizontal Triplex Plunger Pumps, driven by 40 HP 1200 RPM electric motors.

The fluid ends are of aluminum bronze fitted with ceramic plungers, non-adjustable type plunger packing (in both power and fluid ends) and Bakelite insert type valves mounted on Monel valve seats.

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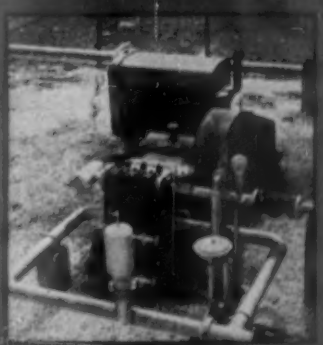

Gaso pump in salt water disposal service in Louisiana

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R. W. Johnson reported that the triple was completed in the Chacra, Gallup, and Dakota for $90,000. This compares, he said, with an estimated $120,000 for single completions in the Gallup and Dakota, and with $217,500 for single completions in each of the three zones. He set cost of drilling a Chacra well at $37,500, a Gallup well at $80,000, and a Dakota well at $100,000. The Johnston-Shear well also was a tubingless completion.

The swift pace of tubingless and multiple completions is largely due to development of many special tools.

A key device in the Sunray sextuple was the oriented perforating gun developed by Schlumberger Well Surveying Corp. A Lane-Wells Co. nuclear oriented perforating gun was used in the Johnston-Shear triple. And in Sinclair's quintuple, special packers developed by Brown Oil Tools played vital parts, along with several other new devices.

Close cooperation between the valve and wellhead manufacturers has resulted in some standardization of valve centerlines for the various size tubing strings. Many special assemblies are still being made, however.

A spokesman for Oil Center Tool Co. says that new wellheads developed for tubingless completions offer more flexibility, in some instances, than their conventional counterparts.

He says the OCT tubingless wellhead, for instance, now permits operator preference as to screwed, individual-flanged, or solid-block valves; permits running of multiple strings either individually or together; permits hanging of strings without spacing out; and permits hanging of one to four strings in the same head.

One major-company engineer, however, says he would "like to see some sort of artificial lift for multiple-completion wells, using one prime mover that would provide necessary flexibility. Also needed is a device to measure oil and water simultaneously as they come out of the hole."

Perforators Get New Look

Big strides also are being made in perforating and fracturing tools and techniques, especially for multiple and tubingless completions.

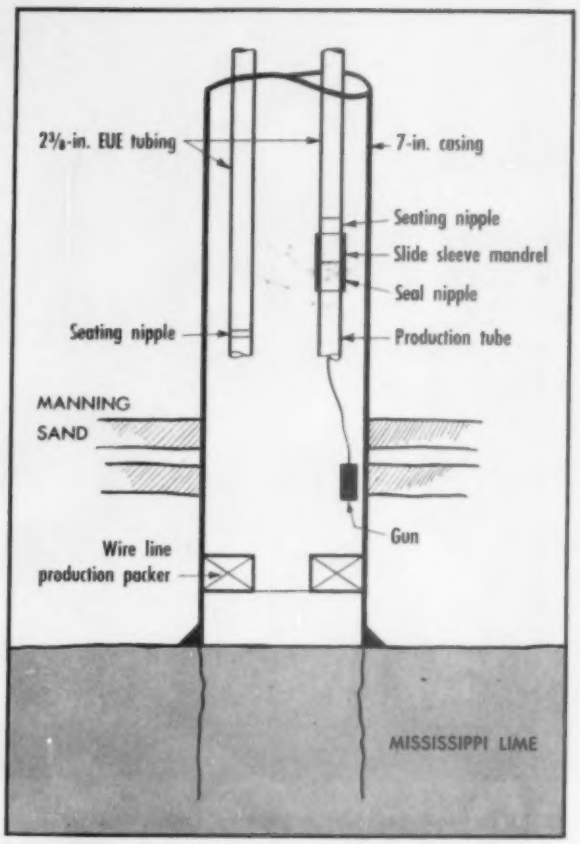
Several devices and methods for directional perforating have been developed, including the Schlumberger and Lane-Wells tools already mentioned.

The simultaneous running of multiple tubing strings made up in bundles is being accomplished successfully through the use of mechanical orienting devices used in conjunction with properly oriented eccentric mandrels installed downhole.

Also gaining popularity are the self-orienting radiation devices run on single or double lines. Since these require no auxiliary downhole equipment, they permit separate running of multiple strings. These latter devices also are effective in permanent-type completions, in that they eliminate the danger of damaging or piercing adjacent tubing strings when an upper pay zone is perforated while the tubing is in the hole.

Welex, Inc., has taken the recently-developed 1½-in. Sidewinder, a Jet Research Center, Inc., development, as the perforating tool, and has designed a mechanically-oriented decentralizer to position the gun.

Welex also has developed a special high-pressure detonating charge to be used on abnormally high-pressure wells. The unit is described as a complete perforating



ORIENTED PERFORATING GUN developed by Welex, Inc., is run through tubing, leaves no debris on packer.

assembly, with a self-contained pressure-detonating switch which can be positioned opposite the zone to be perforated. The actual perforation can take place at some later time, without any electrical or other connections to the perforating tool. The detonation is accomplished by building up the pressure to a predetermined level.

By using sand-laden jet streams or mechanical or explosive tools, operators also are benefitting in some instances from the so-called "notching" technique.

In its simplest concept, the notching technique involves placement of four or more perforations on the same horizontal plane, or the downhole rotation of the perforating tool so as to create a slit in the casing several times longer (on the horizontal) than it is wide. Vertical notching also has been attempted, with varying degrees of success, in specialized instances.

Purpose of the notch is to create and control an artificial fracture in a predetermined direction outward from the well bore. As evolved by Gulf Research & Development Co., the method ties in closely with the company's "mono-plane propping" technique which, in hard or heavily overburdened formations, involves use of rounded walnut shells or other organic material, rather than conventional propping sand.

continued ▶

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Equipment life and production runs can be increased through better barrel tubes and plungers in proper combination. Axelson field representatives are trained to prevent customers from paying for a premium tube or plunger when it may be unnecessary, because, in many cases, a more economical combination may be available. In addition, Axelson has spent thousands of dollars improving manufacturing techniques to produce the most complete selection of barrel tubes and plungers available. Here are the facts:

Barrel Tubes—Axelson's hardened tube has the heaviest case known for maximum wear resistance. It is combined with a strong, resilient, tough outside diameter. Only the I.D. is case-hardened. Threaded ends are unhardened to retain their inherent toughness.

A uniform case depth and hardness is maintained, eliminating soft spots. Axelson helped steel companies develop non-destructive ferro testing to avoid split tubes. Quality is upheld through concentricity, straightness, finish and closely maintained tolerances.

Unhardened tubes are produced for mildly corrosive wells, etc. Exceptionally hard chrome I.D. tubes are available for salt water type corrosion conditions, particularly where abrasion is a problem.

Plungers—The best runs are accomplished by a proper combination of tube and plunger. A careful choice of both is necessary. Axite, chromium plated, hardened steel, regular steel, niaxite, and composite (eutectic, regular iron, hard cast iron) plungers are produced by Axelson to give production men as wide a selection of equipment as possible.

For example, Axelson's Axite plunger surfaces are highly resistant to abrasion, impervious to salt water, extremely resistant to hydrogen sulphide, and non-galling (lowest coefficient of friction of any type plunger available). Axite particles have a hardness of 9 on the Mohs Scale. They are best for extremely corrosive conditions.

Field Tested—A highly abrasive and corrosive California well in the **Bakersfield oil field** had consistently chewed up ordinary plungers (such as one shown at right) **in a matter of several weeks. Axite plungers were finally installed. The Axite plunger shown at left ran 25% longer than the best previous plunger.**

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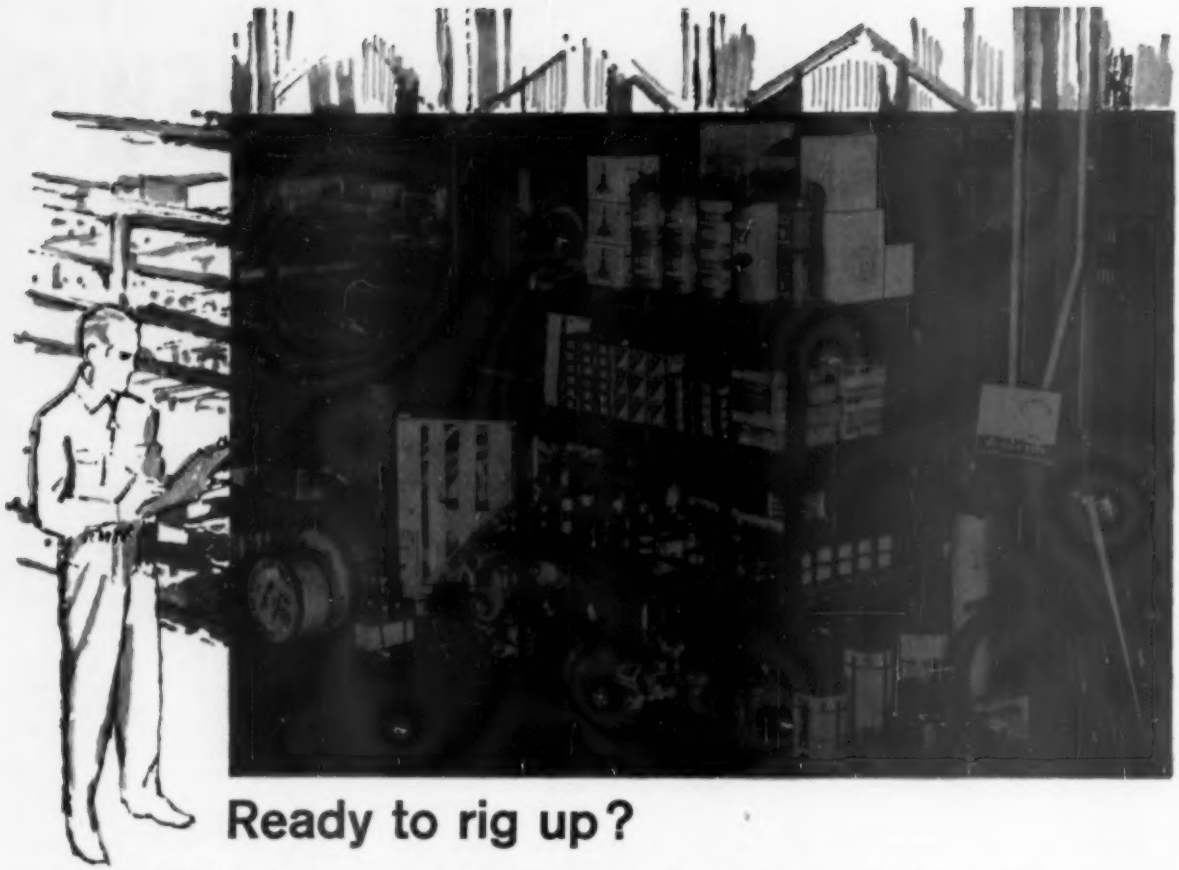

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The notching technique has been licensed by Gulf to several service companies operating in the U.S. and Canada, and reportedly has led to some rather significant production increases, particularly in carefully selected wells on the West Coast and in the Rocky Mountain area.

The advantages of acidizing also are being extended by new techniques.

Dowell recently announced a new technique which, it says, is yielding excellent results in the Permian Basin. Essentially, the treatment consists of high-speed injection of special, slow-reacting acid (PW—May 20'60,p37).

The primary advantage of the method, says Dowell, is that the artificially formed flow channels produced are not blocked by the presence of a propping agent.

Dowell also has introduced a new "dry" mud acid for acidizing in remote areas where the transport of liquid channels would pose difficulties. All the materials used are powdered, and are shipped in cardboard containers. They are simply dissolved in water to prepare the treating solution at the well site.

Other Tools Are Improved

Other new tools and equipment promise further economies and efficiency, as well as opening new avenues of production. One valve that is nearly ready for testing, for instance, will have a 20,000-lb. working pressure.

W-K-M, a division of ACF Industries, Inc., has assembled the valve for a test in South Louisiana that will have surface pressures in excess of 15,000 psi. The valve has a test pressure of 40,000 lb. and is believed to be the highest-pressure valve ever made.

The company reports: "For working pressures greater than 5,000 psi., we use balanced-stem valves. This design overcomes the heavy stem loads inherent in single-stem valves.

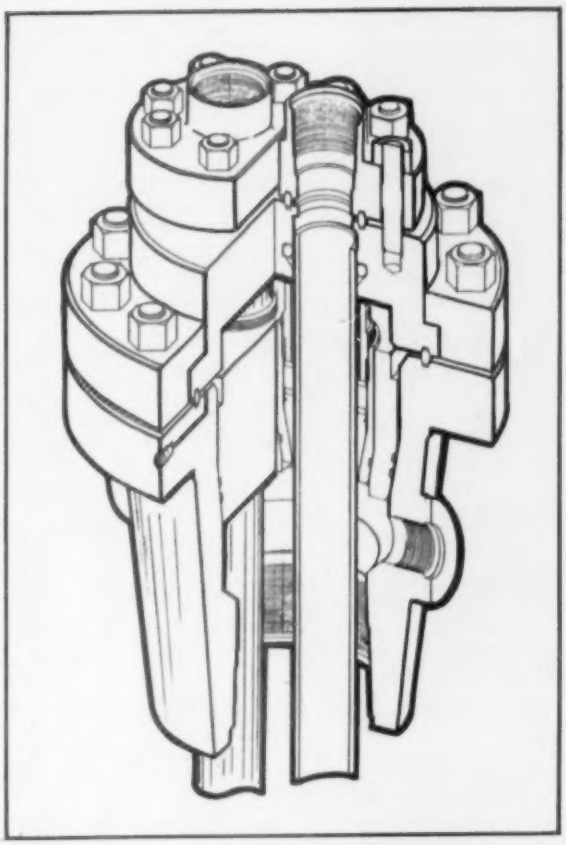
"The 'balancing stem' is attached to the bottom of the gate, and the pressure in the valve body causes it to exert a force equal to, and in the opposite direction from, the force exerted on the operating stem. This valve requires much less effort to operate, since the force on the handwheel must overcome only the gate drag during operation."

An automatic safety valve, which provides ease in manual operation, and at the same time eliminates the need for separate wing valves, has been developed by Cameron Iron Works, Inc.

The Cameron automatic safety valve is a line-pressure-operated unit that closes automatically when the pressure gets too high or too low. But, says the company, the valve can be operated and closed manually, regardless of the pressure in the line, simply by moving a lever to the proper position. The operator can thus use the unit as a combination wing valve and automatic safety valve.

Only three principal moving parts make up the operator unit. These parts include the power piston that moves the gate, the manual selector, and the automatic high-low pilot.

The power piston connects to the valve gate. When line pressure is applied to its enlarged outer surface, the piston moves the gate to close the valve. The line fluid that does the work of closing the valve first passes through a porous metal filter, then through a passage in the piston, to a choke that regulates the rate at which the fluid can enter the cylinder space. This choke is adjusted at the time the valve is installed so that the valve closes at the rate desired by the operator, usually in about two seconds. The pilot valve has a single piston that moves to admit line fluid to the power piston if the sensing pressure is either too high or too low.



CUTAWAY shows test port and flange connections in Oil Center Tool's tubingless dual-completion wellhead.

The Cameron high-low automatic shutoff operator is similar to that of high-low safety valves offered by other firms—but, Cameron says, no additional wing valve is necessary.

Improvements have been and are being made in packers, pumps, compressors, and other equipment in everyday field use.

There have been so many new products and improved tools within the past year, in fact, that it would require a bulky catalog simply to list and describe them. But they are finding their way into the oil patch, with consequent impact on costs and efficiency.

Brown Oil Tools, for instance, has taken a standard packer and reduced it in size so that it can fit particularly small holes—an area made more important by the emphasis on multiple completions. It's also another example of the broader trend toward continued miniaturization of equipment.

continued ▸

The company's 2½-in. Cam-Lok packer can be used as a packer during the flowing life of the well, then can be pulled and converted to a tubing anchor when the well goes on pump.

Continental-Emsco Co. has introduced a special-application casing pump that has both the anchor and seal at the top. The fluid column is held above the seal to stop sand and foreign material from sticking the pump and packer. Because of the top hold-down, the barrel tube does not operate in compression, and remains free of distortion. C-E recommends use of the pump in high-volume wells, where increased plunger displacement is necessary to obtain desired production.

Such high-volume pumping is becoming more popular with operators. Ohio Oil Co.'s R. W. Parker has reported, that, while investment for such pumping equipment is about twice that required for conventional equipment, and operating cost per hour is higher, the operating cost per barrel of oil produced is often less. He added that high-volume pumping can be used when a producing formation contains thin, highly permeable zones connected to a high-pressure aquifier, or when field position or economics makes it impossible to drill additional wells.

Typical of developments in compressors is the Beaird Ingersoll-Rand Challenger 100-hp. to 400-hp. packaged compressor plant. The new unit has application in gas lifting, repressuring, pressure maintenance, field-gas gathering, and similar operations requiring compressors. It can be designed with one, two, or three stages of compression.

Cements Are More Flexible

More flexible cements and cement additives are contributing their share to progress in completion methods.

Research laboratories are well along on the development of fluid-loss additives and retarding agents which, experimental results indicate, will be adequate to meet most deep-well, multiple-completion requirements.

Halliburton has just introduced two new nonacid mud-dispersing chemicals that will help remove fluid mud in the well bore and mud lost to fractured or vugular formations.

The company's Mud-Flush is an aqueous solution of several additives designed to remove water-base drilling fluids from various types of producing formations. The mixture, says the company, effectively lowers the viscosity of mud systems and aids in maintaining solids in a dispersed state. It is said to be particularly effective as an aid in removing large volumes of whole mud lost to the producing formation.

Completion practices during primary cementing may include a nonacid chemical treatment that can be used as a buffer between a cement column and drilling mud, to help prevent mud contamination of cement. Mud-Flush helps prevent flocculation and thickening of the mud adjacent to the cement, thereby minimizing the possibility of channeling.

The company's Oilsperse is an oil-base solution for dispersing water, emulsion, and oil-base muds. Used as a buffer during primary cementing jobs, it helps prevent oil-base and oil-external-emulsion muds from contaminating cement. It can also be used to free stuck drillpipe.

Dowell has recently announced development of a fluid-loss control additive which it considers "a major breakthrough" in squeeze and casing cementing. Tradenamed "FLAC" (fluid-loss additive for cement), the organic chemical has the unique advantage of being chemically inert. In other words, it does not react with the cement, does not increase slurry viscosity, does not change thickening time, does not retard the setting of low-temperature cements, and does not adversely affect set strength.

Though the additive is still considered by Dowell to be in the development stage, it is probable that it will, among other things, permit the adaptation of neat portland slurries and permanent completion techniques to conventional squeeze-cement operations.

A. F. Beale, Jr., Dowell research director, says that one of the biggest drawbacks of previously available fluid-loss additives has been their refusal to set up in low-pressure environments. FLAC, on the other hand, is capable of covering a complete range of temperature and pressure conditions, he says.

Dowell also is expected to announce soon an experimental retarder which acts as a dispersant to impart additional fluidity to the slurry. It's expected to find wide use in multiple completions, and under high pressure conditions.

Wider Use For Computers

Application of electronic computers to oilfield problems, particularly to waterfloods, is another area of significant growth. Central data-processing centers are proving valuable to independents.

Most independents are unable to justify the expense of computers on the basis of their exclusive requirements. So they have turned to consultant computer groups and engineering firms to solve their problems.

One such concern, Earlougher Engineering, of Tulsa, for example, has a waterflood analysis and tabulation service built around an International Business Machines 604 calculating punch and 407 printer-plotter. Begun about two years ago, the program now requires about 150 machine-hours per month.

J. G. Lambert, engineer coordinator for Earlougher's IBM section, says there are three primary advantages to be gained through application of electronic computers to waterflood problems: (1) Detailed information which could not otherwise be obtained economically is available on a month-to-month basis; (2) engineers are freed from time-consuming detail work and can concentrate on analyzing flood performance; and (3) information is presented in a concise tabular and graphic form which permits rapid review of the flood program.

Reprints Available

Reprints of this report are being prepared and will be available in July. Single copies will be sent to Petroleum Week subscribers on request without charge. Additional copies will be billed at the following rates: 1-10 copies, 50¢ each; 11-100, 40¢ each; 101-1,000, 30¢ each; over 1,000, 20¢ each. Address orders to:

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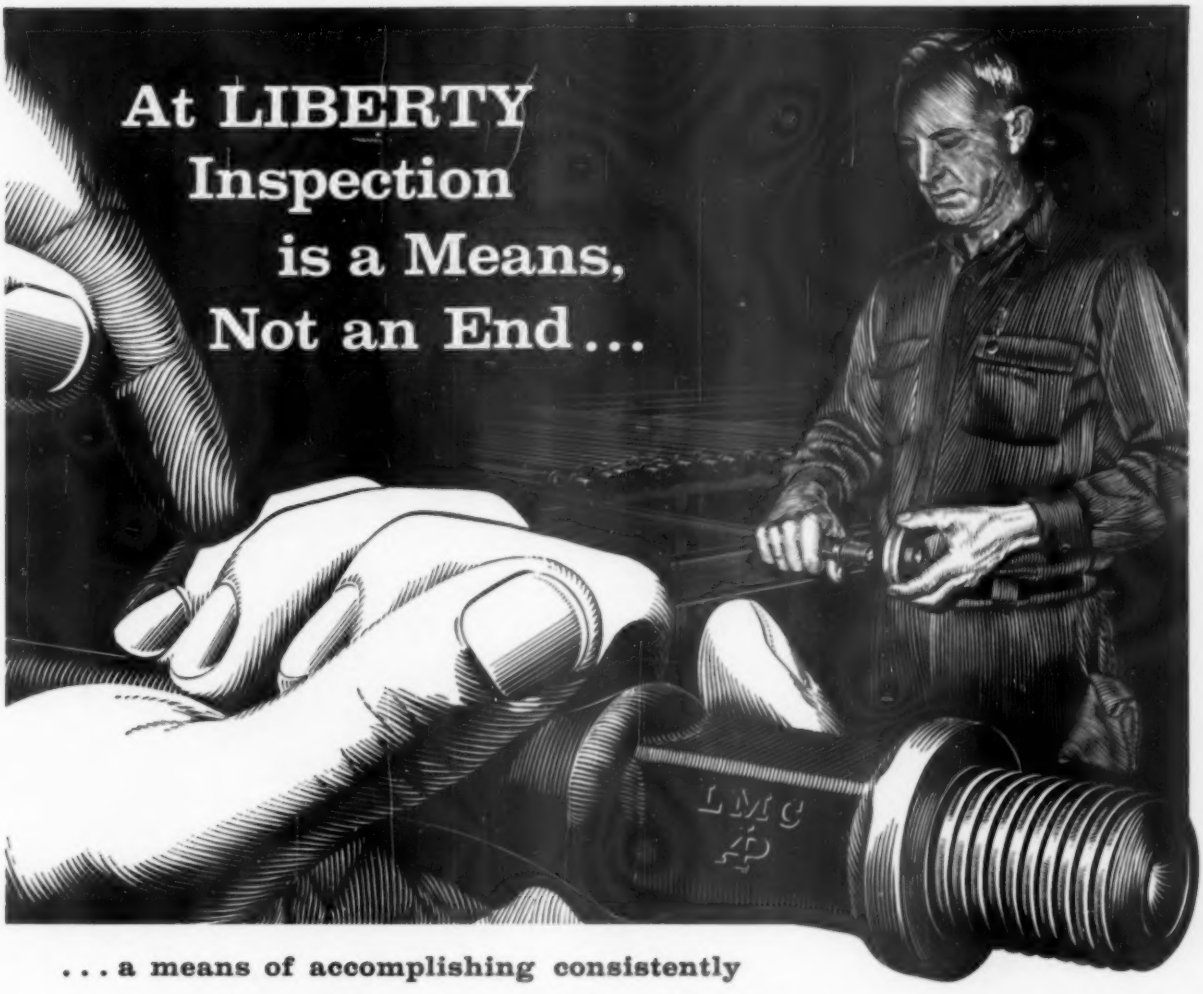

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Inspection is one of the vital steps in the quality control program at LIBERTY MANUFACTURING COMPANY of Texas, but it is only one phase in a well integrated and co-ordinated operation. The end objective, and one kept constantly in mind during every stage of manufacture, is delivery to the well site of the finest sucker rods that advanced design engineering and metallurgy can produce.

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Many Dow chemicals and services work daily for the petroleum industry in countless ways. For example, Dow's Petroleum and Gas Conditioning Laboratories cover a broad spectrum of petroleum problems and needs—from sample analyses of in-use processing chemicals to development of new methods of trouble-shooting and trouble prevention . . . in the lab and in the field. Here's a typical story of how Dow's chemical "detectives" solved a costly case of corrosion for one customer with gas processing problems.

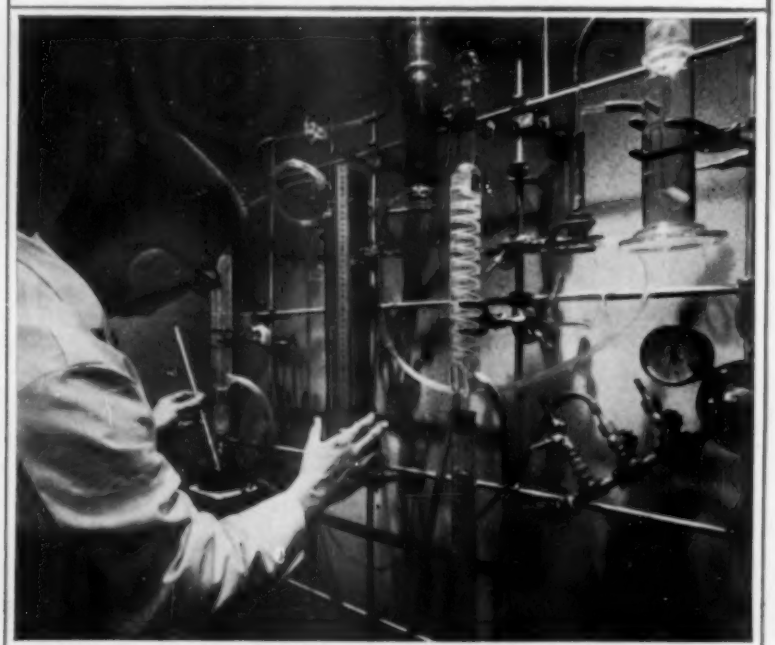
NEW INHIBITOR K.O.'S CORROSION IN GAS PROCESSING EQUIPMENT

The long-standing problem of corrosion of gas processing equipment by MEA (monoethanolamine) solutions has taken a body blow. Though the acidic compounds which gradually appear in these MEA solutions have not been completely identified, their corrosive effects on metal can be virtually eliminated by the use of a new corrosion inhibitor—sodium vanadate.

Michigan Seamless Tube Company of South Lyon, Michigan, parent corporation of Gulf States Tube Corp., has kept equipment and piping free from corrosion for over two years, thanks to the new Dow development.

In this system, natural gas is burned, producing carbon dioxide and nitrogen. In an absorber, the carbon dioxide is removed by a circulating MEA solution. This CO_2-rich MEA recirculates through a reboiler which strips it of the absorbed gas. The MEA solution returns to the absorber for reuse. For three years after installation of the system, corrosion was a costly, serious problem. Piping had to be replaced almost monthly, particularly in the sections carrying MEA from the combustion chamber. The reboiler was also heavily corroded in MEA-contact areas.

In the Dow lab, metal particles are exposed to MEA solutions to prove the inhibiting effect of sodium vanadate.



Dow chemists proposed that Michigan Seamless try the addition of sodium vanadate to the MEA solution, basing their recommendation on the results of sodium vanadate's reaction with iron. The oxide film normally covering iron has cracks, through which ferrous ions pass into solution. But when sodium vanadate is present, the ferrous ions convert to ferric ions, which react to form an insoluble oxide, plugging the openings and preventing further reaction of the metal with the liquid.

This theory was tested, using pipe nipples and test sections of mild steel. They were put into both lean and rich MEA lines and left for a month. Weight loss and rate of penetration of the metal were found to be in the order of 13 grams, and over 93 mils/year, respectively, in both lines! But addition of small amounts of sodium vanadate cut corrosion and penetration to negligible levels. When applied in the Michigan Seamless system, the sodium vanadate additive virtually eliminated corrosion and metal replacement in even the most troublesome areas.

To maintain this protection, Dow chemists periodically analyze the inhibited MEA solution, keeping sodium vanadate content at the proper level.

This case is typical of the customer problems which pass through Dow's Gas Conditioning Laboratories day-in, day-out. And it's typical of the extensive analytic work which goes into their successful solutions. The services of this laboratory are available to industry for any kind of gas processing problem.

• ETHANOLAMINES

. . . absorbing chemicals

The use of Dow ethanolamines for the absorption of hydrogen sulfide and carbon dioxide from natural gas is an old story, partly because product uniformity and purity help produce the best results. But there's more to it than that. Dow chemists constantly work with gas processors to write new versions of the story . . . producing new answers, new techniques of use, and thorough problem analysis. And the knowledge gained will be the basis for solving problems yet to come.

Dow chemists trouble-shoot gas conditioning problems on the spot.

The Dow Gas Conditioning Laboratories maintain voluminous case history files of gas conditioning problems. This invaluable data is available to help solve any gas scrubbing problem, and it's in constant use successfully, as natural gas processors across the country can testify!

Production and refining, too . . .

DOWICIDE PRESERVATIVES

clear up the mud problem

Dowicide® preservatives are Dow's hard working bacteria and fungi fighters. They shield starch-containing drilling muds from microbe attack, preventing decomposition.

This protection is a simple, economical matter, particularly when the pH of drilling mud falls below 11.

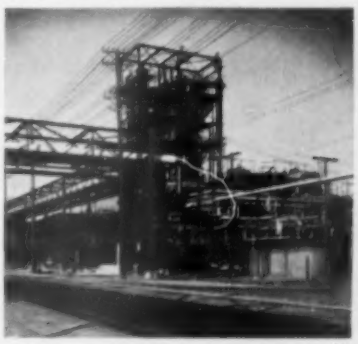
There are other Dowicide preservatives for other specific problems, too. To protect flooding water and retain porosity of below ground strata, use Dowicide F or G. It's equally easy to keep processing water free of algae, fungi and other slimes which often cause trouble in circulating systems. In fact, for *any* process problem of this kind there's a Dowicide preservative to do the job needed.

DOW PHENOL

workhorse chemical

Phenol and phenol derivatives do yeoman duty in refining processes. Some of these compounds perform as gum inhibitors, some as tetraethyl lead stabilizers, and others are corrosion inhibitors in lube oils. Barium phenates function as detergents and as pour point depressants. Alone, or mixed with other solvents, phenol is also used to extract unwanted elements from lube oil stocks.

Dow's wide line of phenol and phenol derivatives can be had in a hurry. And you'll get not only fast delivery, but quality and uniformity of properties that mean results you can count on!



• GLYCOLS

pinpoint depressants

Dow glycols serve natural gas producers by acting as dew-point depressants for gas before it enters the transmission line. As processors know, the formation of gas hydrates can be a costly problem. Dow offers a wide line of polyols made from ethylene and propylene oxide.

Dow is basic in these chemical intermediates. That is, Dow manufactures virtually all of its own "starting point" chemicals. Consequently, the uniformity and purity of these basic chemicals can be kept extremely high. And this quality is reflected in the products used by the natural gas processor.

Dow's "basic" position as chemical producer is an advantage to the gas producer for several reasons, among which are: complete control of quality, starting with the raw materials; a wide line of conditioning chemicals; and widespread production facilities, which mean fast delivery in any part of the country.

DOWELL DIVISION is the largest service company of its kind. From general offices and laboratories in Tulsa, Dowell provides oil and gas well acidizing, formation fracturing, cementing services and chemicals. Their services and petroleum chemical products are available throughout the U.S., Canada, and in South America. For information, write Dowell, Tulsa 2, Oklahoma.

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DOW

"...thinking about big business based on myth or on conditions that no longer exist, or actions that spring from insufficient understanding, bias, emotion, or political opportunism, can do immense harm to our country, and can adversely affect the fortunes of the average citizen."

— M. J. Rathbone, President

ESSO

Standard Oil Company (New Jersey)

Computer Control: How Soon? How Much?

In the U.S. today, there are four known processing units entirely controlled by electronic computers. Two of these units are in refineries, and two in petrochemical plants.

Three of these "closed-loop" installations were made by Thompson-Ramo-Wooldridge Products Co., Beverly Hills, Calif.

Here's what Dr. Thomas M. Stout, manager of TRW's process analysis department, in an interview with PETROLEUM WEEK, has to say about the future of computer control in the processing industries.

Q.—Dr. Stout, would you venture a prediction on the timing of computer-control utilization in the processing industries?

A.—I think it will be a gradual development, taking perhaps ten years before control computers will be accepted in the same way that one-variable controllers are accepted at present.

Individual process units are being placed under control of electronic computers right now, at the rate of one every couple of months. Within the next two years, this pace will accelerate, and you will probably hear about two or three installations each month.

Q.—What about on-line computer control of a complete refinery or chemical plant?

A.—This will not become a reality for a long time. Although it has long been a much-discussed possibility, nobody is even working on it yet.

Q.—Why will this final step take so long? What is the limiting factor?

A.—The main explanation is economic. The prospects for a payout vary with the industry.

Equipment to do the job is available now. Techniques for developing control equations have been worked out. Writing the necessary equations for a complete plant is roughly the same as for a single unit, but the size of the task is obviously much greater.

The incentive for committing enough engineering manpower to tackle such a project depends on the possibility of payout.

But even if it were started now, a project like this would not be completed for several years.

Q.—Why are the payout prospects different in refineries and in chemical plants?

A.—The profit picture is different in the petroleum and chemical industries. Control computers can increase profits in three ways: by increasing a plant's output; by reducing initial or operating costs; or by providing better control of product quality. These advantages interest refiners and chemical manufacturers to different degrees.

Many chemical and petrochemical manufacturers are very much interested in greater production. Refiners, on the other hand, are not as interested in greater output, at least not in the present market.

Computer control can result in higher yields, lower raw material requirements, and/or reduced fuel or steam consumption. But since variable operating costs may constitute only 10% to 30% of the selling price of the product, it is clearly more difficult to justify a control computer by reduced operating costs than by increased output.

I intentionally say "better control of product quality" instead of "better product quality."

Better control of quality refers to reduction in quality variability. By running closer to the specifications as well as eliminating "off-specification" material, costs can be reduced.

Better quality, on the other hand —excessive octane number of gasoline, for example, or excessive purity of a chemical product—can mean unnecessary operating costs.

Q.—Considering refinery and petrochemical techniques, what kind of process seems to you best suited to computer control?

A.—The best applications now seem to be large-volume processes that defy economic optimization without a computer connected directly to the process instruments and controllers.

The essential elements are:

- Numerous and apparently contradictory process objectives;
- Frequent disturbances;
- A complicated set of rules for reacting to those disturbances.

When lower-cost computers are available, installations can be justified in smaller processes.

Q.—Then how do you propose to sell refiners on the value of computer control?

A.—The best approach is a detailed examination of the technical and economic feasibility on a case-by-case basis.

Some refiners have adopted a wait-and-see approach, and this point of view has its advantages. However, the news that a computer has been successfully applied to Company X's alkylation unit doesn't mean that it will be successful for Company Y's catalytic cracking unit. Conversely, if a computer had operated reliably for X, but had not produced the necessary dollar benefits, Company Y should not conclude that its application would also be a technical success but an economic failure. Each process has to be examined individually.

The most favorable case for a computer control installation is a refiner or chemical processor who is able to optimize one of his large, important process units with the help of an on-line computer.

For a really convincing justification, it is necessary to have operating data showing how well the process has

run in the past, equations by which the effects of changes in process variables can be calculated, and a scheme for finding the best values of the variables. With this material in hand, benefits to be expected from installation of a control computer can be estimated at least as well as for any other kind of process improvement.

Where all this information is not available, as is usually the case, you have to be satisfied with less exact estimates. It's well to remember that the detailed work I describe takes time and money, and I suspect you can go too far in insisting on precise justification figures. Where we have made such careful estimates, the result has been essentially a verification of guesses made very early in the project.

Putting it another way, an experienced system designer can tell pretty well in advance of a detailed study whether or not a control computer can be justified for a certain process.

Q.—Who would be the logical man on a refinery staff to work on a computer control installation?

A.—No one man can be expected to do the job single-handed. It takes a team that includes refinery engineers and computer programmers.

Designing a computer control system requires a variety of skills. A good team often consists of a production supervisor familiar with the process, a chemical engineer familiar with the basic chemistry and unit operations, a control engineer familiar with control and instrumentation techniques (including the use of computers in control systems), and a computer programmer. Until refiners develop people with the necessary skills, the control engineer and programmer may have to be supplied by a computer manufacturer.

Q.—When you say "programmer," are you implying that the control computers will be digital computers?

A.—Yes. In my opinion, they will be digital rather than analog computers.

With a digital computer, the first calculation is fairly expensive, but the incremental cost of additional calculations is very small. The digital computer is cheaper for large, complicated problems. Neither the precision nor the accuracy of the results need be limited by the equipment characteristics, as it is with an analog computer.

Q.—Would analog computers ever be used?

A.—Analog computers are very useful for studies of process dynamics, and they will probably find applications in simple process-control problems.

Analog computers have the characteristic that the cost is roughly proportional to the size of the computing job. The analog computer therefore has a cost advantage in small problems.

Analog computers can't do any data logging without the addition of converters, typewriters, and other digital equipment. This fact neutralizes the analog computer's cost edge if data logging is desired.

Finally, the precision of analog computation is limited, and the accuracy depends on the calibration of the computer elements.

In principle, both types of computers can be programmed to do any kind of mathematics. But analog computers require special equipment to multiply variables together, to generate complicated functions of variables, or to do other things that a digital computer does easily.

Latin American Oil Business Looks Up

- **U.S. and Latin American engineers meeting in Mexico City hear of great things ahead for refining and petrochemical business south of the border.**
- **And it will perk up the countries' general economy.**

A substantial expansion of the oil industry in Latin America can be expected in the next decade, according to estimates worked out by Universal Oil Products Co.

UOP's C. W. Curry and W. W. Schnabel told the joint meeting of the American Institute of Chemical Engineers and the Chemical Engineering Institute of Mexico this week in Mexico City that the refining capacity of Latin American countries will have increased more than 50% by 1969.

There are 73 refineries in Latin America now, with an average throughput capacity of 38,000 b/d each. By the end of this decade, the UOP men predicted, there will be 90 refineries, with an average capacity of 48,000 b/d, if the trend of the past five years continues.

Thus, total refinery capacity is expected to increase from the present 2.7-million b/d to 4.3-million b/d.

The countries referred to as Latin America include South America, Central America, Mexico, and the Caribbean.

The expansion will be brought about by two factors: an increase in population, and an increase in per capita consumption of petroleum products.

In 1956 the population of all Latin American countries was 190-million. There were 3.4-million automotive vehicles in operation (including trucks), or one vehicle for every 56 inhabitants. The population is expected to reach 267-million by 1970, a 40% increase. By that time, vehicles will have reached a total of 9.5-million at the present rate of increase —an average of one for every 28 persons.

As a result, the demand for petroleum products by 1969 will probably be 4.3-million b/d, exclusive of exports, says UOP.

UOP believes that there will be no imports of petroleum products by 1969.

At present, about 20% of the products consumed in Latin America are imported.

As in Europe, but in contrast to the U.S., the most pressing demand is expected to be for larger quantities of middle distillate fuels, according to UOP.

There will also be an increase in gasoline quality. The octane number of the gasoline pool in Latin America is expected to reach 92 or 93 by 1970 against its present level of 86.1.

To accomplish these changes—improvement in gasoline quality, higher yield of middle distillates, and corresponding reduction of residual fuel —Latin American refineries will have to install a substantial amount of new equipment, such as cat cracking or hydrocracking units, catalytic reforming, hydrogen treating, alkylation, and polymerization, UOP says.

The increasing availability of petroleum products in Latin Ameri-

another
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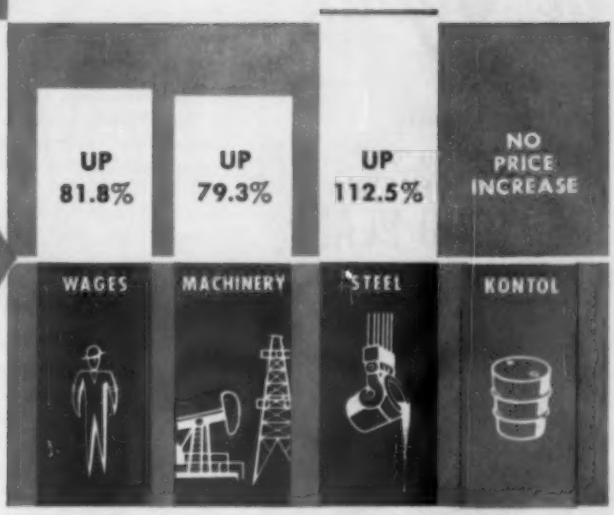
report



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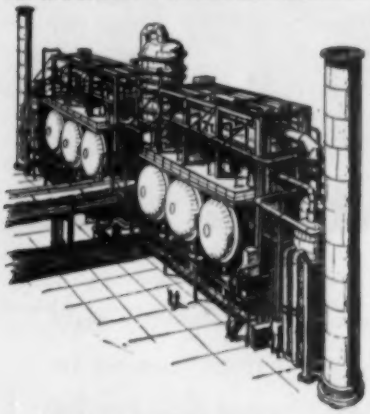

**Japan Synthetic Rubber Co., Ltd.
Yokkaichi, Japan**

This versatile installation is the first butadiene plant in Asia. It is designed to accommodate a wide variety of feed stocks ranging from straight run butane to complex mixtures from steam cracking operations. Design capacity is 25,000 ton/yr of butadiene from butane.

Houdry Dehydrogenation Catalyst is used in the reactors, which are arranged in two parallel systems. Either system of reactors can be operated independently of the other.

By direct dehydrogenation of butane, the Houdry Dehydrogenation Process can produce butene as well as butadiene, and produces other mono- and diolefins from the corresponding saturated hydrocarbons. Complete process description available on request.

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ca will do much to raise the living standards of its people.

"The mere availability of an assured supply of fuel of acceptable quality for power and petrochemical production is probably the greatest stimulus to further the development of Latin American economy," the UOP men told the Mexico City meeting.

Latin America can look forward to a simultaneous development of a large-scale petrochemical industry, according to UOP.

Petrochemicals will grow to the scope of their development elsewhere. This will not only make raw materials available for a growing chemical industry, but it will also stimulate industrial growth in general.

However, petrochemical plants in Latin America must be designed to operate according to local conditions, Chas. E. Waring, vice-president of W. R. Grace & Co., told the Mexico City meeting.

These conditions involve not only engineering considerations, but political, sociological, and materials-availability conditions as well. "Only a thorough knowledge of the situation existing in each country will permit a final decision best suited for local conditions," Waring said.

In Latin America, a distinction must be made between industrially small countries, and countries that are relatively large from the industrial standpoint.

The three "large" countries are Mexico, Brazil, and Argentina. There, the size of the market is such that European or U.S. technology can be applied when designing industrial plants, according to Waring.

In Mexico, for example, three plants are under construction for the production of ammonia. One of these is in Minatitlan, southeast of Mexico City, where Petroleos Mexicanos has one of its refineries. A great petrochemical center will be erected at Minatitlan, Florencia Lara Sosa, of the Instituto Mexicano de Mingenieros Quimicos, told the meeting.

In the "small" countries, on the other hand, the markets are still so limited that the plants required are often no larger than a pilot plant in the U.S., he said.

In these small countries, nearly all the equipment must be imported. There are frequently one or more of the byproducts that cannot be disposed of easily.

Besides, there is an exchange-control problem in nearly all Latin American countries that causes additional expense in importing industrial equipment.

What's New
IN PROCESSING

A U.S. appeals court has overturned a district court ruling that forbade construction of a refinery in Jamestown, R.I., because it would be a "prospective nuisance."

Commerce Oil Refining Co. proposed the Jamestown refinery in 1955, and was immediately prevented from constructing the plant by a small group of citizens, called the Jamestown Protective Assn. (PW—Feb.24'56,p40). Commerce went to federal court to restrain the group.

Last week the appeals court said the district court should not have based its decision on subsidiary findings that the refinery would pollute the air with noxious gases. The case was sent back to district court.

•

Tidewater Oil Co.'s Delaware refinery is the site for a proposed 50-million-lb.-per-year naphthalene plant, to be built by Collier Carbon & Chemical Corp. and Tidewater.

The multimillion-dollar plant will be operated by Tidewater, and will use a patented process developed by Union Oil Co. of California, Collier's parent. The process converts alkyl naphthalenes, one of the basic components of an aromatic byproduct of the refinery, into high-purity naphthalene.

Construction is expected to start early in 1961, and will be completed by the end of that year.

•

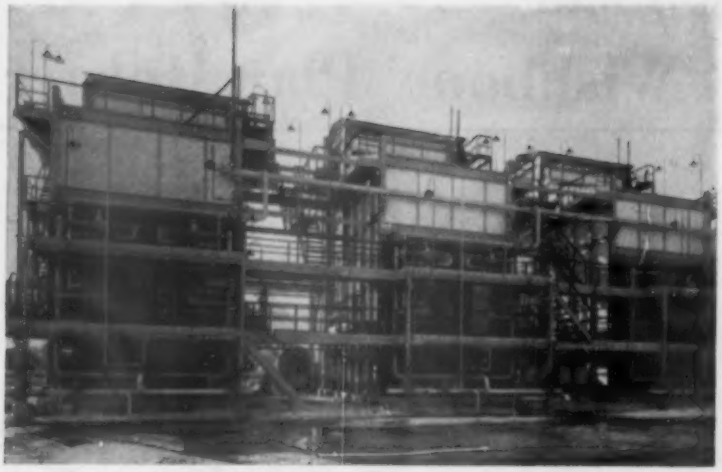
A 3,500 b/d naphtha hydrodesulfurizer will be built at British American Oil Co.'s Calgary (Alta.) refinery. Fluor Corp. of Canada is the engineer and builder.

•

Hooker Chemical Corp. will build a multimillion-dollar plant in northern Kentucky to produce synthetic phenol. Construction will begin later this year; completion is expected by the end of 1961.

Benzene, the major raw material to be used at the proposed plant, will be available from both coal and petroleum sources.

The phenol process developed for the plant is the result of research and development on the Raschig process, which is now being used at Hooker's North Tonawanda (N.Y.) plant.



AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

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Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-BPW.

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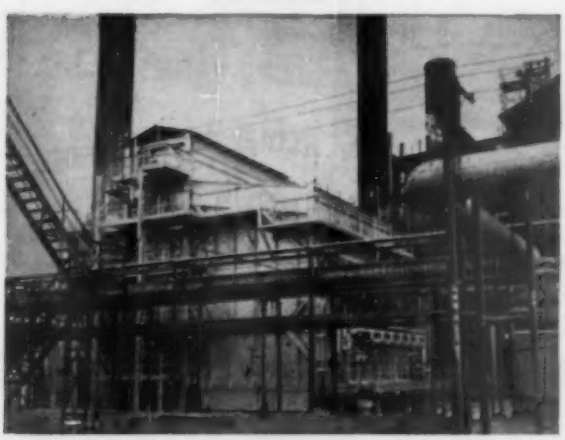
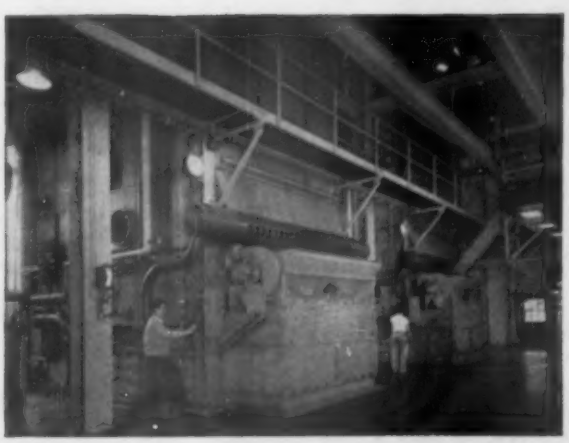


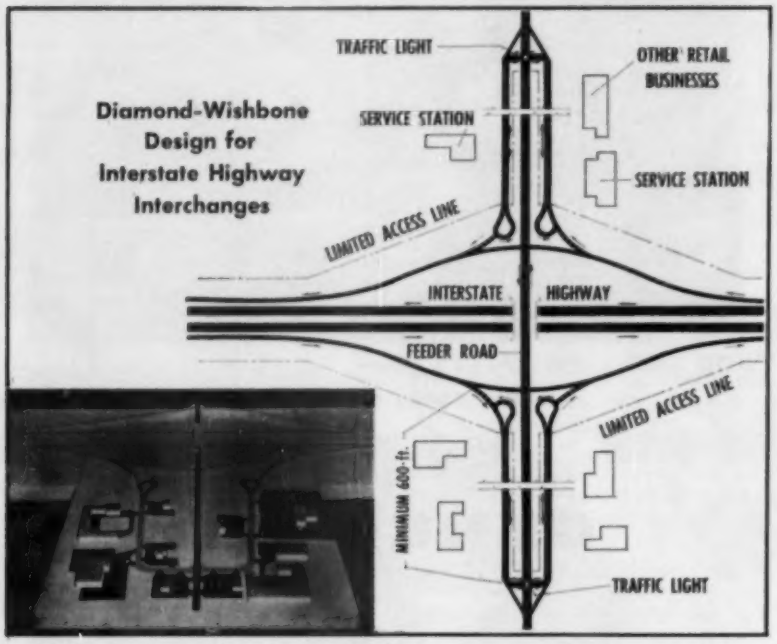
This 400,000 lbs/hr unit is installed in a leading petroleum refinery



Three 40,000 lbs/hr units serve a medical center

DEPT/Marketing

'Wishbone' Plan Bolsters Free Enterprise



THE DIAMOND-WISHBONE INTERCHANGE permits oil marketers to take advantage of local, feeder road traffic, and still serve motorists on interstate highways.

The diamond-wishbone, a new design in highway interchanges, emerged last week as a possible good-luck omen for oil marketers.

Its acceptance by Everett S. Preston, director of the Ohio highway department, paves the way for the construction of competitive (free-enterprise) stations along interstate highway 71. Until last week, it was feared that this 100-mi. stretch of the Interstate Highway System—one of the longest in the nation—would open in August without a single service station located along its entire length. (It extends from Columbus northeast to Medina.)

Conflicting requirements of oil economists, highway engineers, and town planners had frustrated oil company plans to build stations at highway intersections—or some other accessible locations.

The diamond-wishbone interchange miraculously satisfies everybody. But it has even greater significance:

It may well mean the salvation of the industry's "free enterprise" policy of service station location.

Stamp Ruling Stirs Price Crisis

Next week, service station dealers in California may find themselves forced to post two prices for gasoline—the price they've been posting, and a lower price to motorists who don't want trading stamps.

This is seen as the possible effect of a ruling issued recently by Arnold Mosk, state attorney general. But the state Bureau of Weights & Measures, which will enforce the ruling, is seeking further clarification from Mosk.

Mosk, in his ruling, says the "actual"—or lower—prices must be posted on price signs. If a dealer wants to post the higher price, too, that's O.K. But he must post the lower price.

The attorney general is reportedly formulating several alternative proposals for transferring these prices from the signs to the pumps.

The two-price problem stems from a new state code (effective July 1) that requires that a cash surrender value be assigned to and printed on trading stamps.

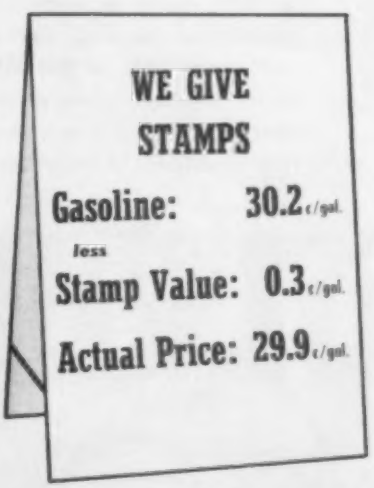
Further, there has long been a law in California requiring dealers to post the actual price that motorists pay for gasoline.

Mosk's current ruling merely combines and clarifies these two laws, according to Wallace Howland, assistant attorney general.

The prospect of two prices turning up at half the service stations in California has placed dealers and suppliers in a furor, as everyone tries to anticipate the possible effects of such pricing.

Here are a few reactions:

- "Now stations that sell stamps will have to admit that their gasoline would be cheaper without them."
- "Stations may have to jack up their prices equal to the value of the stamps."
- "The end of trading stamps is here."
- "Stamps are here to stay, but the ruling will confuse things."
- "There'll be a problem in enforcing the ruling. Dealers universally will flout it, because at first it will be bewildering to them."



GASOLINE PRICE SIGNS may look like this as result of new California ruling.

Fundamental to the two-price problem is an oft-debated question: Do

on Highways

This policy, as stated by API, stresses the benefits of "freedom of choice" and "opportunity" afforded by off-highway locations, as opposed to turnpike stations, positioned along the highway's right-of-way.

Until last week, however, this policy was jeopardized by the failure of oil companies to build outlets that would be accessible to motorists using interstate highway 71. Without such stations, oil men believe that the state of Ohio would be forced to seek monopoly-controlled, turnpike-type stations—which are now prohibited by the Federal Highway Act of 1956.

Now that oil marketers have received acceptance for the diamond-wishbone design the pressure is on them to carry out their highway policy.

"Free enterprise is on trial here in Ohio," says A. B. Carmitchel, vice-chairman of the group that proposed the new design (the Highway, Oil & Planning Committee). "God help our silly souls if we don't act now."

The state of Ohio is in a perfect position to ask for turnpike-type stations at rest areas located 25 mi. apart on highway 71, he says. "It behooves us to make this unnecessary."

One obstacle that the wishbone helps overcome is the poor profit return that faced marketers who built stations to serve interstate highways in other states.

This low return stems from the travel pattern on interstate roads: Most motorists who use these roads have proved to be taking comparatively short trips, and often wait until they reach town before buying gasoline.

The wishbone helps an oil marketer maximize his profit by enabling him to serve feeder road traffic effectively (as well as interstate motorists), and also by permitting him to locate his station at what may well be the cluster point for growth in the surrounding rural areas.

Furthermore, the wishbone design has the blessing of highway engineers, who believe it will lessen the danger of traffic congestion at highway interchanges, despite the potential concentration of commercial facilities there.

Exits and entrances (at the stem of the wishbone), which serve the commercial area, are to be located at least 600 ft. "downstream" from the diamond-shaped highway ramps. Unlike clover-leafs, diamond interchanges force motorists to cross feeder roads when making left turns.

In addition, the loops in the wishbone permit drivers leaving commercial facilities to merge safely with decelerating autos coming off the highway ramps.

Town planners believe that the wishbone design will help avoid the "honky-tonk" commercialization that so often creeps into interchange locations.

The wishbone, they believe, will lend itself readily to zoning laws that will protect the interchange property values. In addition, the wishbone establishes a pattern for orderly development of interchanges. Even though only one quadrant of a wishbone may be required at a certain interchange, the design sets the plan for construction on all four sides of the interchange.

The problem of who is to build the connecting roads between the wishbone and the highway ramps remains an obstacle to station construction.

Since the Bureau of Public Roads has not yet approved the wishbone interchange for interstate roads, the state of Ohio may have to contribute more than the customary 10% toward the cost of these roads.

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trading stamps really lower the price of gasoline?

The California attorney general's office holds that they do: "If stamps are to have a fixed monetary value," says Howland, "it stands to reason that they are to be regarded as a cash rebate."

But recently, the New Hampshire supreme court, in a case involving the state's new fair trade law, found that trading stamps are not a discount.

And in New Jersey, the state supreme court ruled in 1954 that the giving of trading stamps does not affect the price of gasoline.

This fundamental question—and other more immediate problems—will come to a head next week when the new ruling is put into effect.

One problem that stamp companies must face right away is: How much are trading stamps worth? They're universally distributed at the rate of one for every 10¢ worth of merchandise purchased. But how much are they worth for each gallon of gasoline? And what happens when the price of gasoline fluctuates?

'Universal' Credit Card Arrives

Oil Services Credit Corp. announced last week that it will issue 500,000 "universal" credit cards by Sept. 15.

By next year, the company expects to have distributed between 2-million and 3-million. (This compares with the 50-million individual company cards now outstanding.)

Largest company to decide to turn over its credit card operation to Oil Services is DX Sunray Oil Co. Several other regional marketers have signed up.

The plan permits motorists to buy products on credit (including heating oil) from all participating oil companies. If they want to, motorists may take longer than the usual 30 days to pay—at a slight charge.

Oil Services will make daily deposits in the banks designated by the oil companies. The companies, in turn, will repay their dealers.

To maintain company identity, the name of a single company will appear on each universal card and on all invoices sent to motorists—regardless of where he makes his purchases. (It is this company that will be held responsible if the customer fails to pay his bills.)

At first, partcipating marketers will retain their own processing and billing. Later, if they wish, they will turn this over to Oil Services.

Companies can retain these operations and still take part in the plan, benefiting only from Oil Services' promotion of the universal credit card.

In this way, small companies could win more credit-card business—at a cost of ½% of sales.

Cost of the full plan is 3% to 6% of sales, depending upon the number of transactions. In addition, marketers pay $2.10 for each new account. Oil Services says that average industry-wide cost of new accounts is $4.50.

Original plans calling for an advisory council of participating marketers were dropped.

What's New / IN MARKETING

Persistent price cutting by as many as 70 dealers each week threatens to jeopardize fair trade in Connecticut, according to observers in major oil companies.

The trouble spot is the Hartford-Meriden area, which was the sparking point for price wars in prefair-trade days. One economist laments the seemingly unbreakable habit of price cutting in this area. But another marketer points to a single large distributor there as the instigator of weekly price drops.

Recent firming of prices in Massachusetts (PW—Jun.3'60,p40) is noted by one marketer as a positive factor in helping to eliminate border discrepancies in prices. But another points out that Massachusetts' prices are still low compared to fair trade levels in Connecticut.

Meanwhile, in nearby New Jersey, it's rare to find even one or two branded dealers going below fair trade minimum prices, according to one economist. And many private brand stations in New Jersey have recently increased prices.

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Oil men in quiescent Hawaii are concerned about the future stability of their market. General feeling is that it is not big enough to hold new competition. Here are recent developments:

- Texaco Inc. is expected to begin marketing there in 1961. It already has picked out two service station sites (but one was destroyed by the May 23 tidal wave).
- Service station dealers near Armour Oil Co.'s two new discount outlets (one in Honolulu and the other in Hilo) are dropping prices 3¢ a gal. to meet Armour's price cuts.
- Some marketers now believe that Humble Oil & Refining Co. will not enter Hawaii, because of its small market size, despite Humble's recently announced study of the islands.
- The 32,000 b/d refinery of Standard Oil Co. of California won't process gasoline until 1962, but this fall it will begin producing diesel fuel, kerosene, and jet fuel.

•

Next month, service station dealers in Los Angeles County will face six months in prison and fines up to $500 for every day they sell "eye-irritating" gasoline.

This is the effect of Rule 63, which becomes effective on July 1. The measure, which also applies to refiners and distributors, dictates that the eye-irritating potential of gasoline exhaust be decreased by reducing the olefin content in the fuel.

Los Angeles refiners already have been altering their fuel processes in anticipation of the deadline.

•

Atlantic Refining Co.'s scenic outdoor ads scored tops in readership during the first quarter of this year, according to figures released last week by Daniel Starch & Staff.

Over the three-month period, an average of 59% of the motorists interviewed recalled the Atlantic ads. In second place was Standard Oil Co. (Ind.), with 51%.

Heralding
Hunt of FIRST
'Hunt' a Better Deal in Oil Banking!
Not even this business crest can show all the facets of Executive Vice President Russell F. Hunt's career. From law to oil and industry; from Cumberland U. to the Tulsa Chamber of Commerce; from busy colonel to banking and currency; his is a background rich in both public and private affairs. And thanks to his personal experience in the industry, Russell Hunt knows oil men's problems! If you're hunting for the best in oil banking, from one of the most able and experienced oil departments in America (with one of the nation's largest oil-credit files), just . . .
Think . . . 1st of Tulsa
FIRST NATIONAL BANK AND TRUST COMPANY
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION
SINCE 1895

Who buys all the gasoline?

HARD PEOPLE, SOFT PEOPLE OR REAL PEOPLE?

That's right. Real people. Real people who drive right up and ask for 10 gallons of gas so they can go down the street to buy 2 gallons of milk. There aren't any hard and soft people in the *buying* business. Only in the *making* business, where people who make things out of metal and oil and motors get pegged "Hard Goods People." And where people who make food and feminine things get pegged "Soft Goods People."

Why, *we* even get pegged, and we make *advertising*. And advertising isn't made out of *things*. It's made out of *thoughts*. We make ideas and images, and you can't drive an idea, nor can you eat an image. See why we can't be classified, any more than people who buy things can? There's another reason. Our own people have advertised too many different kinds of products to be considered "hard" or "soft" specialists. We have a man advertising batteries (very appealingly) who used to advertise butter (very appetizingly). We have a man advertising tires (very effectively) who used to advertise tablecloths (very elegantly).

So do us a favor, will you? Please don't decide that we're a "Beer Agency" or a "Bank Agency," and that we wouldn't know how to advertise motor oil. Or wouldn't want to. We love to advertise, and we don't specialize.

Is there anything else we can tell you? Just write to the President's Office in Detroit.

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ANOTHER QUESTION: Would you say that a "Man Who Can Sell Refrigerators to Eskimos" has to know more about refrigerators, or more about Eskimos?

Recent Economic Growth — The Numbers Game

If it truly portrayed recent rates of economic growth in the United States, the report on employment, growth and price levels recently issued by the staff of the Joint (Congressional) Economic Committee would point up scarcely less than a national disaster. Among other things, it would document impressively Premier Khrushchev's crack that "the capitalist steed the United States is riding . . . is worn out."

One of the major findings of the Joint Committee's staff (in the Eckstein Report, named for its staff director Otto Eckstein) is that between 1953 and 1959 the average rate of growth of physical output in the United States was only 2.4 per cent per year. This is scarcely more than half the average annual rate of growth of 4.6 per cent the staff found to have prevailed between 1947 and 1953.

Happily, however, the report does not reflect the basic economic realities. Its finding on relative rates of economic growth for the two periods is a statistical *tour de force* which, by the selection of certain figures and certain dates, distorts the record of America's long-term economic growth.

Playing The Numbers Game

By the selection of appropriate starting and terminal periods it is possible to document almost any rate of economic growth that is desired. The table at the bottom of this page shows you how this can be done. It will also show you how the Eckstein staff worked out its shocking contrast in growth rates. The table is built like a schedule of airplane fares between different cities. The postwar years 1946 through 1959 are put down on two axes. One runs down the left hand column, the other runs across the top of the table. Put your finger on the point where the two axes intersect and you have the average rate of growth for the period covered.

ANNUAL AVERAGE GROWTH RATES OF THE U.S. ECONOMY, 1946-1959*

(Percent increases, starting year to terminal year, of GNP in 1954 dollars).

Starting Year \ Terminal Year	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
1946	X	–0.1	–1.9	–1.2	3.0	3.9	3.8	3.9	3.2	3.7	3.6	3.4	2.9	3.2
1947	X	X	3.8	1.8	4.1	4.9	4.6	4.6	3.7	4.2	4.0	3.8	3.2	3.5
1948	X	X	X	–0.1	4.2	5.3	4.8	4.7	3.6	4.3	4.0	3.8	3.1	3.4
1949	X	X	X	X	8.7	8.1	6.5	6.0	4.4	5.0	4.6	4.2	3.5	3.8
1950	X	X	X	X	X	7.4	5.4	5.1	3.4	4.3	3.9	3.6	2.9	3.3
1951	X	X	X	X	X	X	3.4	3.9	2.0	3.5	3.2	3.0	2.2	2.8
1952	X	X	X	X	X	X	X	4.4	1.3	3.6	3.2	2.9	2.0	2.6
1953	X	X	X	X	X	X	X	X	–1.6	3.2	2.8	2.6	1.6	2.4
1954	X	X	X	X	X	X	X	X	X	8.1	5.1	4.0	2.4	3.2
1955	X	X	X	X	X	X	X	X	X	X	2.1	2.0	0.5	2.0
1956	X	X	X	X	X	X	X	X	X	X	X	1.8	–0.2	2.0
1957	X	X	X	X	X	X	X	X	X	X	X	X	–2.3	2.0
1958	X	X	X	X	X	X	X	X	X	X	X	X	X	7.0
1959														

*Compound rates of growth

Following this procedure, you can find growth rates ranging all the way from −2.3 per cent, between 1957 and 1958, to +8.7 per cent, between 1949 and 1950, along with almost any other rate you would choose for various years and sequences of several years over the postwar period.

For example, if you want to demonstrate that the postwar growth rate through 1953 was less than 4% per year, you take off from 1946, include a drop of 0.1 per cent between 1946 and 1947, and come up with a growth rate for the 1946-1953 period of 3.9 per cent. But if you want to show it was quite high, you take off a year later, from 1947 (which drops out that dismal −0.1 per cent for 1947) and come up with a fine growth rate of 4.6 per cent for the 1947-1953 years.

Statistical Hocus-Pocus

That's what the Eckstein staff did. It took off at one end from a year when there was just about no growth, went to the Korean War boom year of 1953 at the other end, and got that average growth rate of 4.6 per cent. Then it took off from the Korean War boom year of 1953 and ran to the year 1959, when business was recovering from a recession and suffered through a steel strike of 116 days, to come up with its 2.4 per cent growth rate for the second postwar period. As the table indicates, by taking off a year later (1954) the average growth rate would have become 3.2 per cent, and if the take off had been 1949 it would have been 3.8 per cent.

There are those who, in nontechnical terms, would characterize this as statistical hocus-pocus. There are also those who would see in it an element of political hocus-pocus, too. This is because the years 1947-53, when the Eckstein staff found there had been the healthy 4.6 per cent growth rate, were roughly years when we had a Democratic president, while the anemic growth rate of 2.4 per cent it calculated for the subsequent years was for years of a Republican presidency.

Actually it can be shown that the civilian part of our economy has had more rapid growth during the Republican administration than it had during the Democratic years. If military expenditures are subtracted from the national ouput, the resulting growth rate for 1953 to 1959 is slightly higher than for 1947 to 1953.

However, we do not question the *bona fides* of the Eckstein staff. **But we do assert that it has produced a statistical picture of the postwar growth of the American economy which is dangerously misleading both at home and abroad.**

Abroad, the report appears to give official documentation to the propaganda line that the Soviet economy is running rings around the U.S. economy in growth, and that it is Communism a country should choose if it really wants to develop rapidly. Building on a much smaller economic base than the U.S.A., the Soviet Union — as well as almost every less advanced nation in the world — is bound to show a larger percentage increase in output than the U.S.A. But the Eckstein staff calculation gives the Communists ammunition they don't deserve.

Are We Facing A Crisis?

The contrast drawn by the Joint Committee staff in postwar U.S. growth rates suggests that we are facing scarcely less than a crisis through paralysis of our economic growth which calls for drastic remedies. But this, as the full 1947 to 1959 growth record set forth in the table makes clear, is very definitely not the case. Our over-all postwar rate of growth, as measured by the gross national product in physical terms, has been 3.5 per cent per year, a rate nearly double the long-term growth rate of 2 per cent per year between 1909 and 1939. In the continuing fluctuations in the rate of growth which more or less inevitably characterize a relatively free economy, we have had some downs in recent years. **But our economy is now on the upbeat again. And at the end of this year, the U.S. economic growth rate for the postwar period can be expected to be 3.7 per cent per year.**

It is extremely important for the United States to continue to maintain this rate of economic growth or even to surpass it. Upon this effort depends our capacity to meet our defense requirements without dangerous strain, to provide an adequate margin for foreign aid, to improve our own productive facilities, and to continue to raise our own standard of living.

How not only to maintain but possibly improve upon our postwar pace of economic growth will be the subject of strenuous debate in the months ahead. However, the debate will have a much better chance of being constructive if the postwar growth record is seen in proper perspective. To this end one of the first things to do is to junk panic rousing statistical portrayals such as that in the Eckstein report.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

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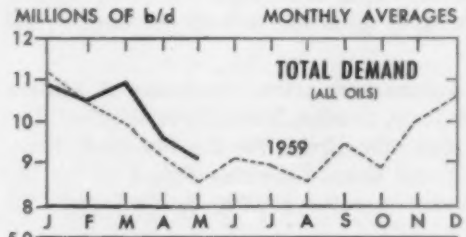
PETROLEUM WEEK'S

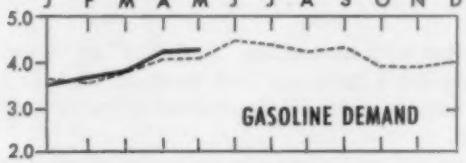
Fingertip Figures



Figures for period ended June 17, except as noted

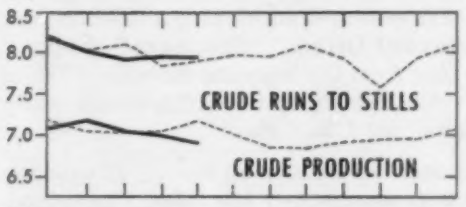
TOTAL DEMAND

Latest 4-week average	9.189
Year ago	8.893



GASOLINE DEMAND

Latest 4-week average	4.575
Year ago	4.346

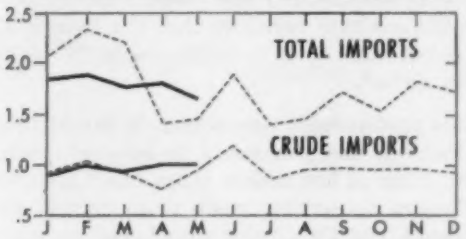


RUNS TO STILLS

Latest week	8.034
Previous week	7.835
Year ago	8.000

CRUDE PRODUCTION

Latest week	6.840
Previous week	6.772
Year ago	7.017

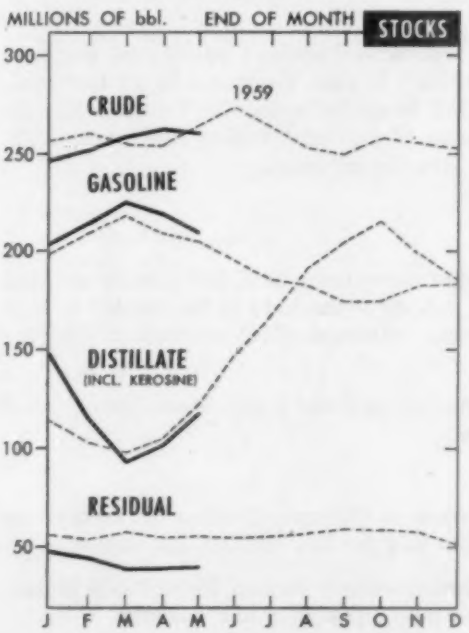


TOTAL IMPORTS

Latest week	1.513
Previous week	1.654
Year ago	1.819

CRUDE IMPORTS

Latest week	1.013
Previous week	1.079
Year ago	1.255



CRUDE STOCKS

Week ended June 17	259.8
Previous week	259.3
Year ago	263.1

GASOLINE

Latest week	204.4
Previous week	207.9
Year ago	200.6

DISTILLATES

Latest week	129.9
Previous week	126.9
Year ago	138.5

RESIDUAL

Latest week	39.9
Previous week	40.4
Year ago	54.4

Crude stocks have risen above the so-called "desirable" level by more than 8-million bbl., despite cutbacks in domestic production.

A quick look at the crude inventory level shows that it has risen more than 6-million bbl. since the first of the year, and now stands at 258.9-million bbl.

Most of the bulge in inventories has come from the sharp rise in crude stocks of foreign origin.

Foreign crude stocks have risen to 16.8-million bbl., an increase of 3.3-million bbl. since Jan. 1—not a surprising situation, considering that crude imports have averaged 995,000 b/d so far this year, up 8.5%.

Domestic crude output so far has averaged 7,018,000 b/d, down 1.9%.

The largest gains in crude stocks of domestic origin are from Louisiana, Wyoming, and Oklahoma.

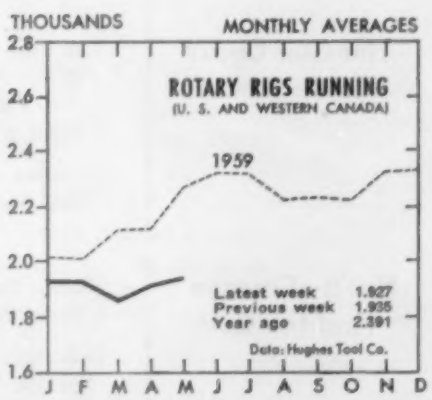
Stocks of Louisiana-origin crude rose 1.4-million bbl. during the past six months, and now total 19.3-million bbl. Crude stocks of Wyoming origin were up 1.3-million bbl., and from Oklahoma, up 1.2-million bbl.

Crude of Texas origin accounted for the largest drain on stocks. Inventories are down 913,000 bbl. from Jan. 1.

The drop in stocks occurred in West Texas, the Gulf Coast, and North Texas.

Reductions in refinery runs in the second quarter of this year to slightly below 1959 contributed to some of the crude stock build-up.

Lower runs and a rise in crude inventories are normal in the second quarter, as demand declines seasonally. But stocks are still above the desired level—a surplus that bears heavy on the economic position.



The Market Trend

Communistic Oil and Capitalistic Tankers

The irony of the Communist oil offensive is that it's being mounted in capitalist tankers. In fact, the 6-million tons deadweight of laid-up tankers in western estuaries is a made-to-order situation to help the Soviets sell their oil.

Last month, as usual, the Russians were active charterers of western tankers. They took clean ships for Italy, Sweden, West Germany, East Germany, Poland, and Brazil. They took nine dirties for the Far East, Scandinavia the United Arab Republic, and Cuba. They also signed up for two three-year contracts of affreightment to cover 680,000 tons of crude for Japan.

This oil doesn't move in bottoms with names like "Red Star" or "Good Ship Nikolai Lenin." The Russians don't have any fleet to speak of. When they want tanker tonnage, they have to come to established shipping centers in London, Bergen, and Oslo.

Instead, the tankers mostly have esteemed Scandinavian titles such as "Thorsheimer," "Ida Knutsen," "Rudolf Oetker," "Spinanger," "Troma," and the like. Two Italians got a play from the Russians recently—"Punta Spiga" and "Emanuele Morasso." And nobody on the vodka circuit would put a handle on a ship like "Juanita" or "J. M. Ugland."

So you have the weird predicament of Russian oil moving all over the world under respectable flags and at murderously low rates. That's free-price capitalism for you. But an unfortunate result is that the Reds get a big assist in peddling oil from tanker rates down to Scale —40% for spot clean and Scale —57½% for term dirties.

There must be a moral in this predicament somewhere. It might be: Cure the sickness in capitalist tankers, and you won't be hearing much about the threat of Communist oil. Even at low tanker rates, the Russians are getting miserable netbacks. They're not getting much more than $1.40 a bbl. on crude going west. For Japan, the f.o.b. price runs lower, usually about $1.32 a bbl.

If tanker rates were firm, Russian oil couldn't sneak past principal western producing centers. It couldn't bypass Venezuela to go to Brazil. It couldn't bypass the Persian Gulf to go to Japan. The Russians already have proved they can sell oil cheap. If capitalist tanker rates were high, the Communists would have to give the oil away.

The Gulf Coast Looks Firmer:

The U.S. Gulf market is in a kind of never-never land, but chances are that prices soon will be moving up. Nobody seems to be in the market to buy. But for the first time in months, offerings of all products are on the light side.

Gasoline discounts seem to be limited to 0.25¢ a gal. Discounts on No. 2 fuel have vanished completely.

No. 6—Chicago And the Gulf:

Heavy fuel prices slipped last week in Chicago. Hughes Oil reduced its tank wagon price 0.25¢ a gal. to 9.3¢ for lots of 1,500 gal. and over.

But residual prices at the Gulf are extremely strong. Nobody will be surprised if the $2.10 cargo quote gets bid higher this summer.

The Market Place AROUND THE WORLD

Prices compiled for PETROLEUM WEEK by Platt's OILGRAM Price Service and National Petroleum News, McGraw-Hill Publications

All prices as of June 20

Bold face type indicates changes from previous week

KEY PRICES—REFINED PRODUCTS

(¢ per gal. except dollars per bbl. where $ is shown)

Western Hemisphere

U.S. Gulf Coast, cargoes
- Gasoline, 98 oct prem....11.75-12.75
- Gasoline, 92 oct reg....10.75-11.5
- Kerosine....9-10
- Heating oil, No. 2....8-9
- Gas oil, 48-52, d.i....8.25-8.875
- Fuel oil, bunker "C"....$2.10-2.25

Caribbean, cargoes
- Avgas, Grade 100/130....14.75
- Gasoline, 93 oct research prem....11
- Gasoline, 87 oct research reg....10.125
- Gasoline, 80 oct research....9.375
- Gasoline, 70-72 oct motor method....9.25
- Kerosine....9.25
- Heating oil, No. 2....8
- Gas oil, 48-52 d.i....8.25
- Fuel oil, bunker "C"....$2.00

New York Harbor, barges
- Kerosine....9.8-10.3
- Heating oil, No. 2....8.8-9.3
- Fuel oil, No. 6....$2.47

Okla.-Group 3, northern shpt., bulk
- Gasoline, 91 oct reg....11.5-12.25
- Kerosine....9.125-9.625
- **Heating oil, No. 2....7.75-8.75†**
- **Fuel oil, No. 6....$1.80†-1.90†**

Chicago, bulk
- Gasoline, 91 oct reg....12
- Heating oil, No. 2....8.5-10.35
- Fuel oil, No. 6 high sulfur....7.4

Los Angeles, rack
- **Gasoline, 88 oct reg....11.25↓-12.65**
- Diesel fuel, PS 200....7.75-11.25
- Light fuel, PS 300....$2.80
- Heavy fuel, PS 400....$2.15-2.35

Natural Gasoline, Grade 26-70
- FOB Group 3....4.5
- FOB Breckenridge, Tex....4

LP-Gas
- Propane, Oklahoma (Group 3)....3.5-4
- **Propane, Baton Rouge....4.625↓**

Pennsylvania Lubes
- Bright stock, 25 p.t....24
- 200 vis. neutral, 25 p.t....27

Mid-Continent Lubes, Tulsa basis
- Bright stock, solvent, 95 v.i....26-27
- Neutral, solvent, 200-210 vis....23-24

Gulf Coast Lubes
- Bright stock, solvent, 95 v.i....26
- Neutral, solvent, 200 vis....23

Eastern Hemisphere

Singapore (Pulau Bukom) cargoes
- Avgas, grade 100/130....15.875
- Gasoline, 79 oct research....9.75
- Kerosine....10.125
- Gas oil, 48 d.i. minimum....9.5

KEY PRICES—CRUDE OIL

(2¢ differential per deg. of grav. applies except as noted)

Western Hemisphere

United States (at the well)
- Mid-Continent, (Okla.-Kan.), 36.0-36.9....$2.62-2.97
- North Dakota, 36.0-36.9....2.47-2.87
- Texas:
  - Gulf Coast, low cold test, 26.0-26.9....3.50
  - Gulf Coast, Upper & Lower, 26.0-26.9....2.92-3.22
  - West Texas, sweet, 36.0-36.9....3.00
  - West Texas, N.M., inter., 36.0-36.9....2.93
  - West Texas, N.M., sour, 32.0-32.9....2.71
  - East Texas, flat....3.05-3.25
  - Mirando, 28.0-28.9....2.96-3.31
- Illinois Basin, flat....2.85-3.00
- Pennsylvania Grade, Bradford dist., flat....4.70
- California, Signal Hill, 21.0-21.9....2.32†
- North Louisiana-Arkansas, 36.0-36.9....2.72-3.02
- Wyoming, sweet, 36.0-36.9....2.85-2.90
- Wyoming, sour, 32.0-32.9....2.63-2.71

Canada (flat prices, at the well)
- Pembina (Alta.)....$2.38
- Leduc-Woodbend (Alta.)....2.53
- Redwater (Alta.)....2.42
- Steelman A (Sask.)....2.44
- Virden (Man.)....2.30

Venezuela (Cargoes, FOB lifting port designated)
- San Joaquin, 41.0-41.9, Puerto la Cruz....$3.10
- Oficina, 35.0-35.9, Puerto la Cruz....2.78-2.80
- Tia Juana, Medium, 26.0-26.9, Amuay....2.30
- Bachaquero, flat La Salina....1.85
- Tarra, 38.0-38.9, San Lorenzo....2.83
- Lagunillas Heavy, flat, La Salina....2.07

†Differential per deg. of grav. varies

Eastern Hemisphere

Middle East, Persian Gulf (Cargoes, FOB lifting port)
- Arabia, 34.0-34.9, Ras Tanura....$1.90
- Safaniya, 27.0-27.9, Ras Tanura....1.50
- Iran, 34.0-34.9, Bandar Mashur....1.86
- Iran, 34.0-34.9, Abadan....1.81
- Iraq, 35.0-35.9, Fao....1.80
- Kuwait, 31.0-31.9, Mina-al-Ahmadi....1.67
- Qatar, 41.0-41.9, Umm Said....2.05
- Neutral Zone, Burghan, 23.5-24.4, Mina Saud....1.51
- N. Zone, Eocene-Ratawi, 20.5-21.4, Mina Saud...1.38

Middle East, Eastern Mediterranean
- Arabia, 34.0-34.9, Sidon....$2.27
- Iraq, 36.0-36.9, Tripoli, Banias....2.31

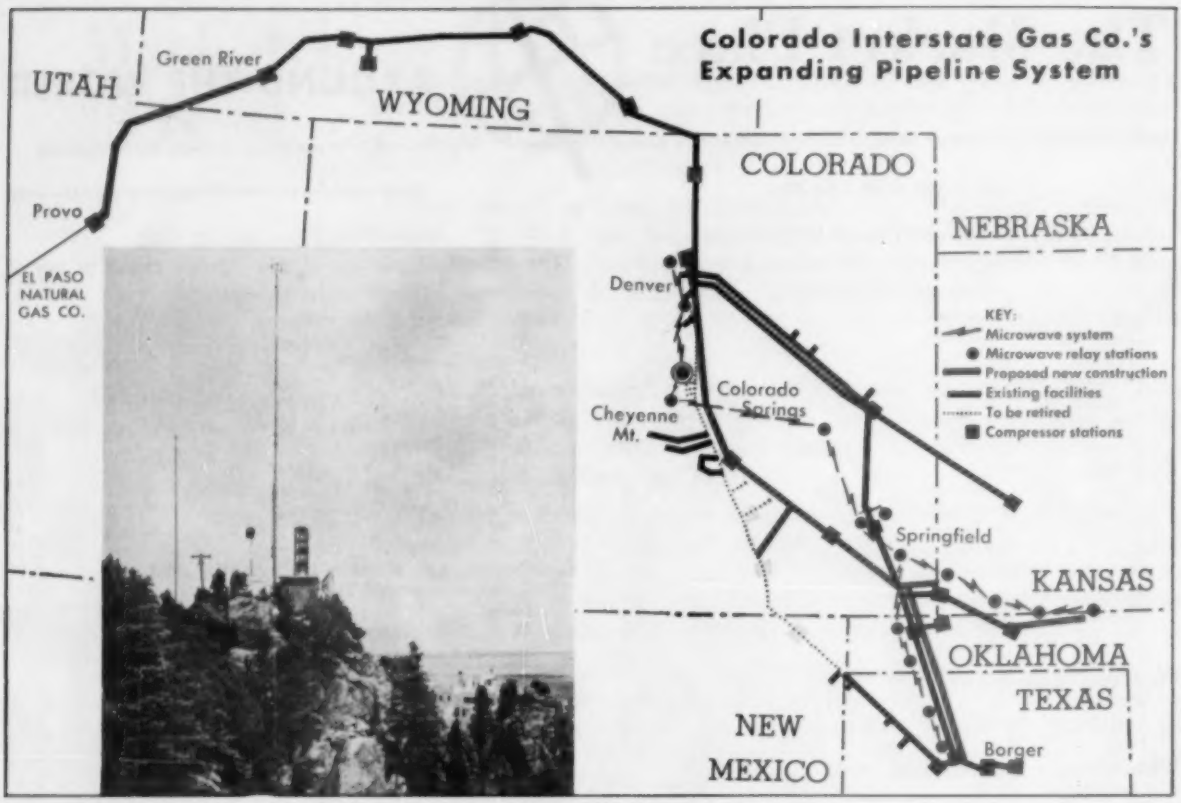
Far East, Cargoes FOB Lutong, Sarawak
- Seria Light, flat....$2.57

KEY TANKER RATES

(Last paid, per long ton, single voyage)

- U.S. Gulf-New York, clean....(USMC—22½%) $2.21
- U.S. Gulf-New York, dirty....(USMC—27½%) $2.07
- NWI-USNH, dirty....(USMC—60%) $1.10
- **NWI-UK/Cont., dirty....(Scale—62½%) 12/3*↓**
- Persian Gulf-UK/Cont., dirty....(Scale—67½%) 22/2*
- **Persian Gulf-USNH, dirty (USMC—77½%) $2.86↓**

**Sterling*



SATELLITE STATION at Springfield, Colo., receives signals from Colorado Springs via microwave relay towers, like one shown above.

Pipeline Automation Takes Key Stride

As part of a broad expansion program, Colorado Interstate Gas Co. has put in use the first fully automatic supervisory control system on a natural gas pipeline to operate its compressor station at Springfield, Col.

The 5,400-hp. station is on the company's pipeline that moves gas from Texas, Kansas, and Oklahoma into the Rocky Mountain area (PW—Jun.3 '60,p50).

Ultimately, all of Colorado Interstate's stations—several of which are still in the planning stage—will have their own automatic control.

The automation system was designed by Southwestern Industrial Electronics Co., Houston, which says the "real significance" of its concept is the fact that all engine functions are locally controlled at the station itself.

The major advantage of this type of system, according to SIE, may be that it's not subject to disruption because of a communications breakdown as is the case in a remote control setup.

SIE says that the cost of automating the Springfield station was about $80,000, and that the cost of connecting additional stations would be roughly $30,000 apiece.

Headquarters of the system is at Colorado Springs. But unlike the headquarters on a conventional remote control system, it serves only as the primary control center.

In the usual remote control setup, most of the station regulating functions, including the key one of engine selection, are performed from control headquarters.

The chief difference between Colorado Interstate's new system and a remote control system is that in the former the compressor station runs by itself—after it's given an initial signal.

A natural gas pipeline is operated by regulating the pressure at its compressor stations.

The most important pressure is the discharge pressure, which exists at the output of the station.

This pressure may be controlled one of three ways: manually, remotely from a control headquarters, or automatically at the station itself.

On the Colorado Interstate system, once the dispatcher transmits a set point (a figure equal to the discharge pressure desired at the Springfield station), controls there take over and carry out the order.

There are two ways by which the set point is transmuted into actual discharge pressure at the station: engine selection or control, and speed control.

To establish a new discharge pressure, the following sequence of events is required:

First, the dispatcher at Colorado Springs initiates the set point by setting it on his control panel and transmitting it to Springfield. After the message is received by the station, it is returned to headquarters for verification, and then is retransmitted.

Now, the satellite station assumes control.

The first thing that occurs is that the station's discharge pressure controller "recognizes" that a difference

Mr. John W. Kelley (seated) President of Columbia Gulf Transmission Co., Houston, and Mr. S. Orlofsky, Vice President, examine model of Clark TPV gas engine now installed in their Hampshire, Tennessee compressor station.

ANOTHER DRESSER BREAKTHROUGH

WORLD'S MOST POWERFUL GAS ENGINE FOR PIPELINE SERVICE BUILT BY CLARK!

The Nation's ever-growing need for natural gas means that the present gas network will be increased from 596,000 to 878,000 miles within ten years. By creating the powerful TPV gas engine, Clark Bros. Co., one of the Dresser Industries, is helping pipeline companies to deliver gas at minimum cost to consumers.

Combining two-cycle simplicity and dependability with V-type compactness and efficiency, the new Clark TPV engine provides savings in installation, housing and operating costs. It is another dramatic innovation made possible by the vast knowledge and experience of Clark engineers whose "precision by the ton" products include heavy-duty gas turbines and compressors as well as engines.

At Clark Bros. Co., Olean, New York, as with all Dresser operating companies, new products are continually being researched, developed, tested and introduced. Individually, in combination, or as a complete group, Dresser companies are prepared to put their specialized yet diversified skills and worldwide facilities to work for you.

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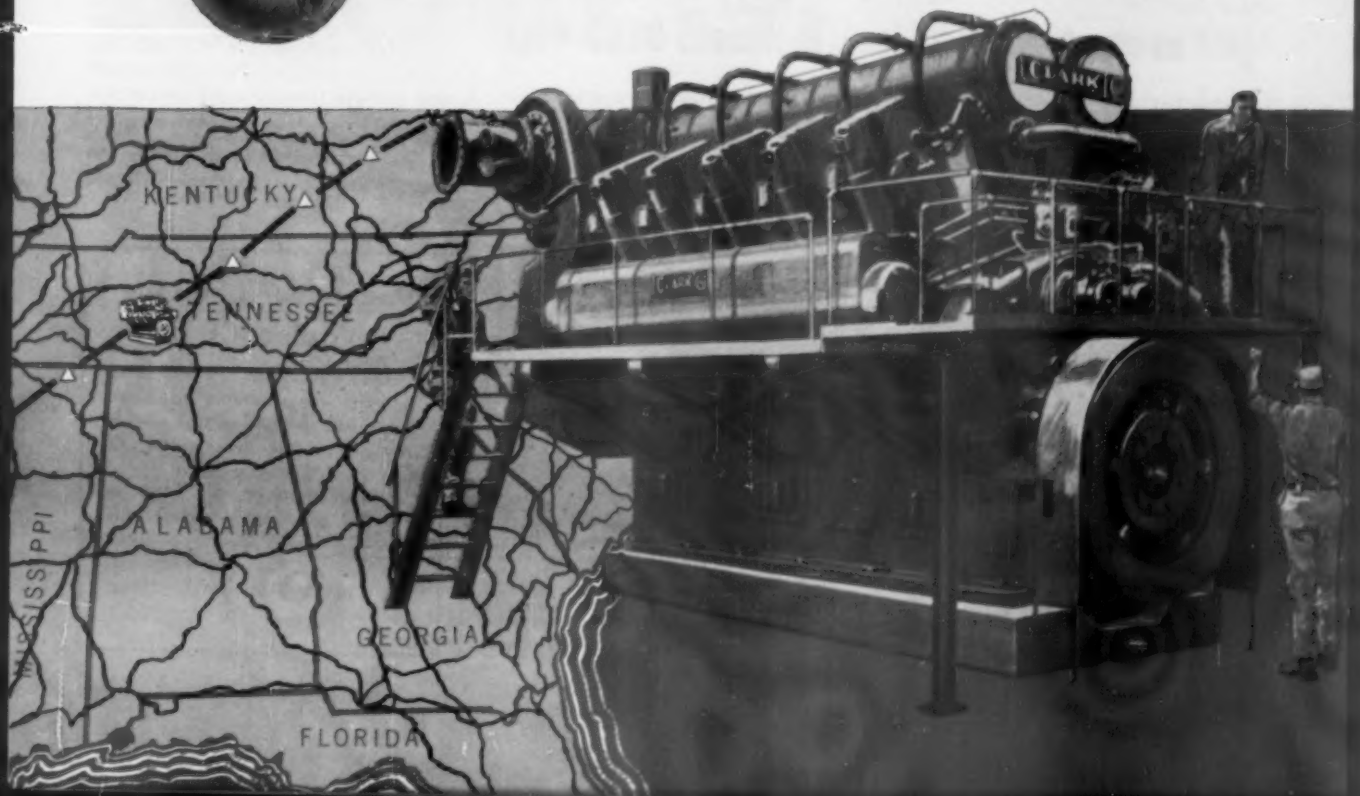
EQUIPMENT AND TECHNICAL SERVICES FOR THE OIL, GAS, CHEMICAL, ELECTRONIC AND OTHER INDUSTRIES



exists between existing and desired discharge pressure. The controller then relays an "error signal" to the station's engines, which, in turn, automatically increase or decrease their speeds to correct the discrepancy and achieve the new discharge pressure. If, at this juncture, the new pressure hasn't been achieved, the controller sends another signal to add or subtract an engine, depending on whether more or less pressure is needed. When this last adjustment is made, the station begins operating at its new pressure.

Actually, engine control only goes into play when the difference between the existing and new pressures is too great to be adjusted by regulation of the speed of the engines.

The station is also equipped with an alarm system, which shuts down an engine in the event of malfunction, and also records the trouble for corrective action.

It's called a "log-alarm-shutdown system."

Such things as excessive temperature of lube oil, unnatural engine vibration, fire, or a gas leak, will cause an engine to be shut off.

Several other malfunctions will also cause a shutdown.

In addition, trouble of any kind at the station is automatically recorded on a log.

Colorado Interstate's satellite system is designed for ultimate inclusion of 19 more stations.

At present, the company is operating nine stations on its pipelines from West Texas and the Oklahoma Panhandle, and Kansas to Colorado. These stations, with the exception of the one at Springfield, are manually operated, but are in communication with one another through a microwave system (PW—Oct.12'56,p27).

The next station to be put on an automatic basis reportedly will be

Underground Storage Vital, IOCC Hears

The need for underground gas storage in serving populous areas was stressed at last week's parley of the Interstate Oil Compact Commission.

To illustrate, it was reported that in Michigan underground storage makes it possible to serve 850,000 customers—ten times as many as could be served without the facilities.

20% lighter than cotton duck but just as sturdy and flexible... Quaker Thermoid OS&D Hose

Strong but light. Extremely rugged but flexible. That's Thermoid-Quaker "Quaflex" Oil Suction and Discharge Hose.

It's lighter than reinforced cotton-duck hose, but it won't expand under pressure. It won't collapse under suction. It's exceptionally kink- and crush-resistant.

For more details, call your local Thermoid distributor, or write to *Thermoid Division, H. K. Porter Company, Inc., Tacony and Comly Streets, Philadelphia 24, Pa.*

HERE'S WHY: Separate layers of nylon tire cord surround a helix of high-tensile spring-steel wire in Thermoid-Quaker "Quaflex" Oil Suction and Discharge Hose. That's why it's just as sturdy and flexible as cotton duck, although lighter in weight.

Nylon tire cord for lightness, strength.

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Armco Line Pipe Combines Strength and Economy

New steels are born at Armco

Low residual stresses in line pipe mean more strength to handle unforeseen or accidental overloads. Tests show that the maximum residual stress in Armco Pipe is about 90 per cent less than in many commonly used standard pipes.

It's thrifty to specify Armco Line Pipe, too. You don't pay for "extra" steel—132 different diameter-wall thickness combinations let you meet your requirements *exactly*.

Write us for complete information on Armco Line Pipe. Armco Drainage & Metal Products, Inc., 5010 Curtis Street, Middletown, Ohio.

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T-C JET STRAINERS ON
A WEST TEXAS WATER FLOOD

**The One
Sure Way to
Clean Up Injection
Flood Water**

There's a big difference in water filtration equipment. Here, for example, are three small, compact, T-C Self-Cleaning Jet Strainers with a huge capacity for handling injection flood water. But best of all, these strainers require little attention, even less maintenance expense. In fact, their operation is fully automatic. They clean themselves when the baskets become dirty. At a pre-leter-mined pressure-differential across the basket, rotating jets go into action and scour the baskets clean. The entire cleaning operation takes only a few minutes.

T-C Jet Strainers are available in 10H, 20H and 30H sizes. 100, 200, and 400 mesh screens are interchangeable, depending on the particle size of sand and solids to be removed from the water. Extremely fine filtration, down to sub-micron particle size—including algae and bacteria—can be obtained easily with the aid of a diatomaceous earth coating on the basket.

If you attach importance to the cleanliness of your flood water—and most operators do—you should know all about T-C Jet Strainers. A brochure will gladly be sent on request.

T-C JET
Self Cleaning
STRAINERS

THORNHILL-CRAVER CO.
P. O. Box 1184 Houston, Texas

one still to be built on the company's line in Wyoming. SIE says it will deliver equipment there later this year.

By the end of the month, however, according to SIE, it will install controls "similar" to those at Springfield at a new field compression station now under construction at Borger, Tex.

The Borger station will, in fact, be autonomous, but an operator will make the discharge pressure settings.

Colorado Interstate is awaiting Federal Power Commission authority to build about 600 mi. of new line and 8 more compressor stations, and boost the horsepower at three others. The company says it's planning automatic control for all these stations.

The $91-million project would raise the delivery capacity of its system by about 300-million cf/d (PW—Dec.18 '59,p50).

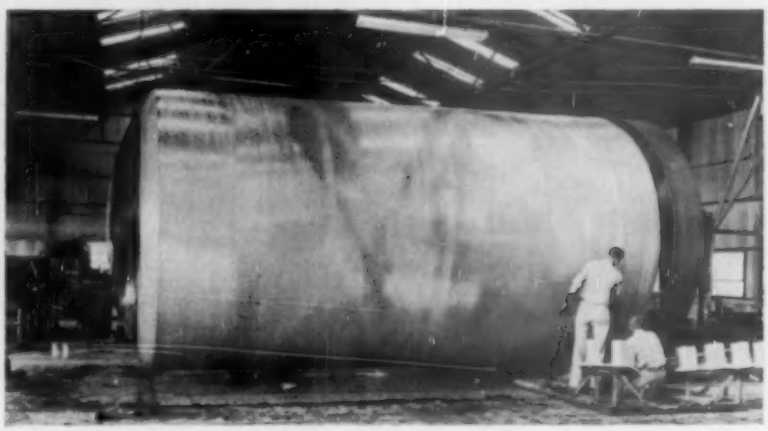
It wants to deliver 235-million cf/d of the additional gas to El Paso Natural Gas Co. at Provo, Utah (PW—May27'60,p17).

New lines proposed include one 359 mi. in length from Texas' West Panhandle field to Denver, another of 155 mi. from Green River, Wyo., to Provo, Utah, and about 85 mi. of gathering lines in Kansas, Oklahoma, and Wyoming.

New stations will be built at Pueblo, Denver, and in the Arkansas River valley, in Colorado, at Laramie, Rawlins, Sweetwater, and Green River, Wyo.; and at Provo. Horsepower will be increased at existing stations at Bivens and Fourway, Tex., and at Keyes, Okla.

The company also wants to retire in other applications 275 mi. of its Texas-to-Denver line, and seven compressor stations en route.

Glass Tank Resists Corrosion



HELICAL WINDING of thin filaments is reported to produce a tank wall of high strength.

A tank constructed of epoxy-resin-bonded glass filaments, which is said to be resistant to corrosion by crude, has been developed by Black, Sivalls & Bryson, Inc., Kansas City, Missouri.

The company reports that its new tank has withstood corrosion in tests with sour crude, hydrogen sulfide, gas, carbon dioxide, salt and fresh water, and various treating chemicals.

It also says that its new tank-building material is both nontoxic and odorless, and thereby is suitable for containers for the storage or transportation of contamination-sensitive products.

The novel vessels—called Poxyglas tanks—are built by helically interweaving the glass filaments on a mandrel, treating them with the resin, and then heat-curing the bonded mesh.

The filaments used are 0.000368 in. in diameter. They are woven to a wall thickness of 0.125 in.

The shell and head of the tank is wound as an integral structure. The bottom, however, is moulded separately and is attached to the shell by specially designed flanges.

Thus far, BS&B has made the tanks in sizes up to 12 ft. in diameter by 20 ft. high.

It claims that its tanks are "competitive in price" with comparable-size steel tanks with a wall thickness of 0.25 in. Unlike steel tanks, however, the Poxyglas tanks are designed to operate at atmospheric pressure.

They are able to withstand operating temperatures up to 250F.

What's New / IN PIPELINES, TANKERS, STORAGE

Canada's National Energy Board has O.K.'d a plan of Interprovincial Pipe Line Co. to build two new remotely controlled pump stations and boost horsepower at two existing ones.

New stations will be constructed at Souris and Manitou, Manitoba, and additional facilities will be built at stations at Kerrobert, Saskatchewan, and Sarnia, Ontario.

The $2,730,800 program will add a total of 19,900 hp.

Interprovincial says that the additional horsepower is needed to increase throughput, which averaged 321,400 b/d last year, but could rise to 437,700 by 1961.

•

The Florida Railroad & Public Utilities Commission is opposing a request by Houston Texas Gas & Oil Corp. for a permanent 11% rate boost on gas delivered through its new pipeline (PW—Jul.17'59,p33).

In a statement to the Federal Power Commission, the state agency asserted that the proposed increase, which would amount to $1.3-million a year, was "premature," in that the pipeline is less than a year old.

The state commission, which has O.K.'d temporary hikes, told FPC the request for a permanent boost is based on "pure speculation" as to future costs.

•

A combination dry-cargo-tank truck has been developed to carry two payloads on the same trip.

The vehicle is a Fruehauf Trailer Co. tandem-axle flat-bed. It has two tanks, with a total capacity of 5,700 gal., slung under the body.

One such truck is now being used by Allyn Tank Line, Inc., a Los Angeles trucker, to haul fuel oil and steel products in California.

•

Lone Star Gas Co. plans to build a 48-mi. pipeline to move 60-million cf/d of gas from North Texas fields to Dallas.

The company says the new line would extend from Springtown, Parker County, to its Irving station, near Dallas. The gas would come from Jack and Wise Counties.

Shell Tankers, Ltd., has converted one of its tankers for transport of both crude and propane.

The ten-year-old vessel, the Gryotoma, is able to carry about 747 tons of propane in 22 high-pressure steel bottles, in addition to 5,671 tons of crude.

Former crude capacity of the ship was 7,763 tons.

•

Tomlin Transportation Co., Casper, Wyo., has sold its tank truck division to Consolidated Freightways of Delaware, Inc.

The sale involved the transfer of 40 trucks for a price of approximately $250,000.

Consolidated plans to operate out of Casper.

•

Augusta Pipe Line Co. has merged with Kaneb Pipe Line Co.

Stockholders approved an exchange of three shares of Kaneb common stock for each share of Augusta common, and ratified a three-for-one split of common.

•

The Federal Power Commission has set oral argument for July 12 on two rate boosts, totaling $15.8-million, sought by United Gas Pipe Line Co.

Examiner Samuel Binder has recommended that the proposed increases be cut by about $6.5-million.

•

Installation of prototype rubber-impregnated fabric "pillow tanks" for jet fuel storage is under way in the Gulf of Mexico off St. Petersburg, Fla. (PW—May6'60,p80).

The 10,000-gal. tanks will be anchored in 40 ft. of water. Completion is scheduled for early next month.

Sponsors of the project are Jet Fuel & Storage Co., Firestone Tire & Rubber Co., and Global Marine Engineering Co.

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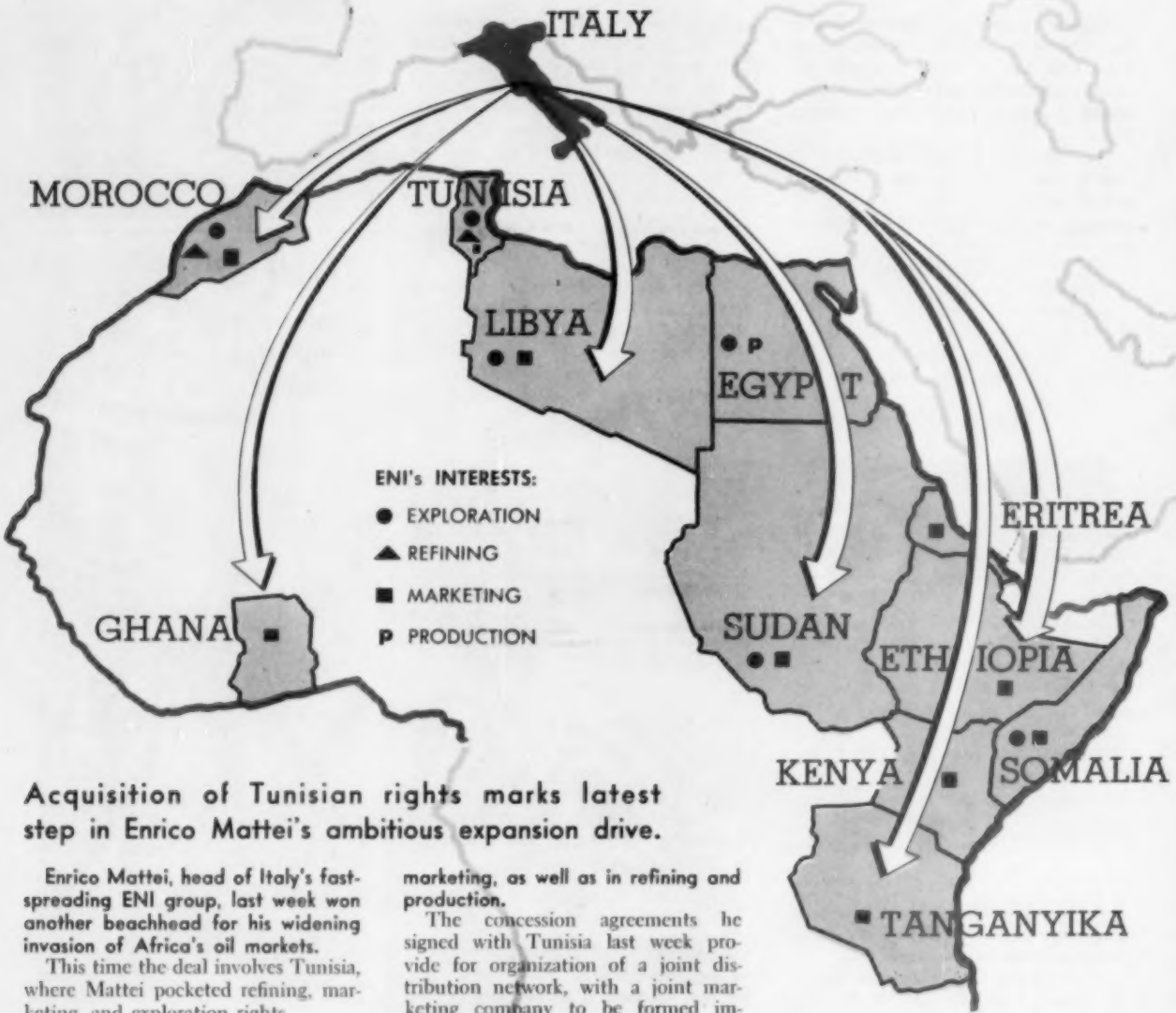
Italy's ENI Adds 11th Country to Its



Acquisition of Tunisian rights marks latest step in Enrico Mattei's ambitious expansion drive.

Enrico Mattei, head of Italy's fast-spreading ENI group, last week won another beachhead for his widening invasion of Africa's oil markets.

This time the deal involves Tunisia, where Mattei pocketed refining, marketing, and exploration rights.

Tunisia brings the score to no less than 11 different African countries in which he has lined up varying stakes for ENI—mostly within the past couple of years. Scarcely four years ago, the state-owned ENI group's only interests outside of Italy were in Egypt. Today, Mattei—dedicated to the idea of joining battle with the international majors—has spread ENI operating interests over four continents, with the broadest concentration in the budding markets of Africa.

Mattei won his latest African concessions in Tunisia with his first deal for local government participation in marketing, as well as in refining and production.

The concession agreements he signed with Tunisia last week provide for organization of a joint distribution network, with a joint marketing company to be formed immediately.

The refining agreement calls for ENI to build its second African refinery in Tunisia, with initial capacity of 20,000 b/d—double present Tunisian demand—and eventual capacity of 30,000 b/d. ENI's first plant in Africa will be built in Morocco.

The Tunisian plant will be built at La Skirrha, terminal of the crude oil export line to be completed in October for the neighboring Algerian Sahara discoveries developed by Creps, a French company in which Shell has a 35% interest.

Tunisian government officials were quoted as saying that crude for the plant would be bought on the "open market" from companies "offering the lowest prices."

Tunisia, according to reports from Tunis, will bear half of the $20-million cost of the refinery.

ENI headquarters in Italy, however, were equivocal on this point in confirming the general terms of the agreement. They did say, though, that the Tunisian government will take half of the plant's product output.

The Tunisian exploration agreement follows the same pattern as ENI's so-called "75-25" deals with

Invasion of Africa

Iran and Morocco, but the exact area to be covered isn't settled yet.

ENI's acreage will consist of all or part of some 3,225 sq. mi. (20%) of the Extreme South permit that is due for relinquishment in September by Serept, a French-Tunisian company with which Mobil International went into partnership this year (PW—Jan. 22'60,p64). Notification of the areas the companies choose to relinquish is due by July 10.

There was no indication last week how much of it will go to ENI—which will carry exploration costs, with the Tunisian government coming in as a 50% partner in the event of a commercial discovery.

ENI said the Tunisian agreement ended a long fight for a refining concession against established marketers there—who will be "forced" to draw their product supplies from the ENI plant.

The companies—Esso, Shell, Mobil, British Petroleum, and Petrofina—had submitted their own proposal to build a 10,000 b/d refinery, solely for internal demand, at Tunis, the major consuming center.

ENI said these companies had refused state participation, and had also refused to build their proposed plant at La Skirrha, a new port town which the Tunisian government wants to develop as an industrial center.

Mattei said ENI's plant there will be similar to the 20,000 b/d plant in Morocco on which it will start construction this week under a joint venture with Moroccan capital.

ENI now holds exploration interests in a total of six African states—plus Iran—which may eventually provide crude for its two projected 20,000 b/d African refineries in Morocco and Tunisia and a proposed refinery in Sudan on which it still has a bid pending.

Iran apparently holds out the most immediate prospects, though there is still no official confirmation of ENI's reportedly promising discovery in its initial wildcat in the Persian Gulf.

In Africa, ENI also was reported last week to have had oil shows in its initial wildcat in Morocco. ENI itself wasn't talking.

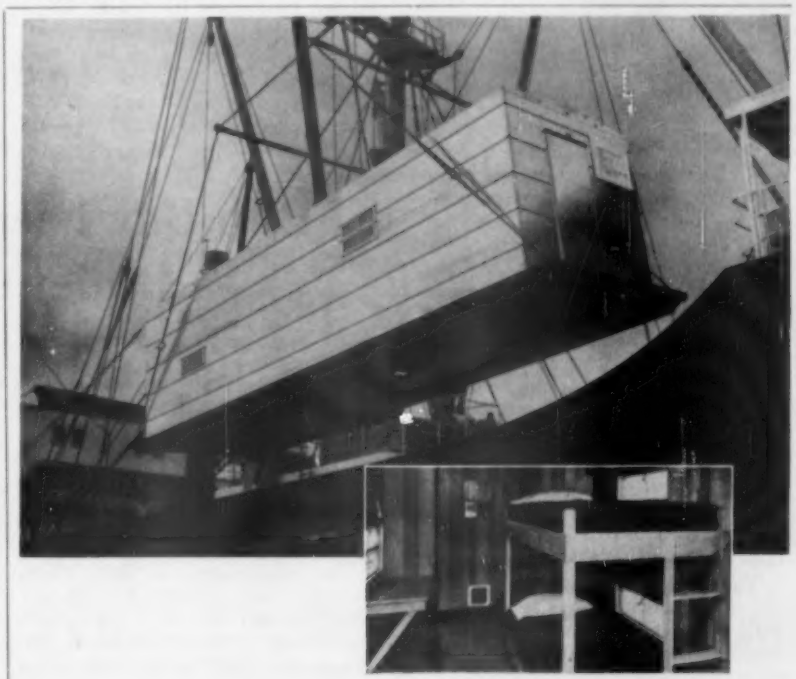
Its other exploration interests in Africa—besides those slated in Tunisia—are in Libya, Somalia, Sudan, and Egypt, where it also has a stake in established production.

In the meantime, ENI has lined up marketing outlets in ten African states so far, with signs that it's aiming for deeper penetration into East Africa in particular.

The list to date: Ghana, Morocco, Libya, Sudan, Eritrea, Ethiopia, Somalia, Kenya, and Tanganyika—plus, now, Tunisia.

ENI's moves in many of these countries are still on a small scale, limited to distribution of motor fuels and lubricants. In others, such as Ethiopia, it has started opening its own gasoline stations and its own bulk plants.

The tipoff to bigger plans came with the recent announcement in Tanganyika that ENI would invest $22.4-million in new installations in East Africa through a marketing subsidiary newly registered in Kenya (PW—Jun.17'60,p66).



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U.S. Firms Boost Middle East Buying

BEIRUT—More and more Middle East oil operators are placing orders for technical equipment locally, rather than in the U.S. or Europe.

For years, oil companies working in the Middle East have been buying some foodstuffs and general supplies in the countries in which they operate.

But orders for specialized technical equipment have almost always been placed directly with manufacturers in Europe or the U.S.

Now, however, many of the firms active in the area are buying through locally based companies or distributors of American- and European-manufactured equipment.

The reason for the change is pressure from Middle East governments anxious to reduce oil company costs and to boost local business.

Oil companies operating in the Middle East have maintained U.S. and European purchasing offices, which, Mid-East oil states claim, are costly and cut into the governments' share of oil profits.

The nationally conscious Mid-East states also are increasingly attempting to get oil companies to deal with local businessmen in local currencies.

American Independent Oil Co. is an example of a company that has shifted its purchasing patterns to conform with the trend.

The Neutral Zone operator formerly did all of its purchasing in the United States, through its San Francisco office. After moving to New York, it planned to open a purchasing office in London.

But two months ago Aminoil gave up that idea and is now doing all its buying through manufacturers' representatives and distributors in the Persian Gulf area.

On the other hand, Arabian-American Oil Co. is holding to the view that purchases of technical supplies and equipment can best be handled through direct contact between the firm's agents and manufacturers.

How long this policy can continue, however, is problematical. Abdullah Tariki, Saudi Arabia's director of petroleum, has been attempting to get Aramco to disband its Aramco Overseas Co., the firm's purchasing agent.

Aramco is increasing its local buying of nontechnical supplies. In 1959, the company's payments to Saudi Arabian suppliers totaled $5,872,000—up 13% from 1958. The money went for such items as cement blocks, oxygen, acetylene, brick, tile, and millwork.

The trend to local purchasing has prompted several American manufacturers to set up shop in the Middle East, often in joint ventures with local businessmen.

The local interest makes the ventures acceptable to authorities. And the technical know-how of the manufacturers satisfies the needs of the oil companies.

Some of these joint firms have built bonded warehouses in the main oil ports, or private warehousing facilities in the free zones of Bahrein and Beirut, to stock materials.

Iran Again Asks Bids

TEHERAN—Three of the six petroleum districts that Iran recently declared closed to bids for new oil rights have been reopened for six months starting in September. Bids for the districts, Nos. 8, 14, and 18, should be filed between Sept. 1 and Nov. 1, National Iranian Oil Co. announced. All three areas are far inland—Nos. 8 and 14 south of Teheran, and No. 18 to the east, south of Khurasan.

CFP to Buy French Refiner As Outlet for Sahara Crude

PARIS—France's sole international major has been given a green light to expand its marketing interests to provide a new outlet for Sahara crude.

A long-pending deal under which Compagnie Francaise des Petroles will buy an independent French marketer-refiner was finally approved by the government last week.

The independent is Ozo, which currently holds about 4% of the French market and has a supply contract with CFP. From now on, half of its operations will be based on Sahara crude.

The deal will boost CFP's share of the French market above 17%, including 5% held by its refining affiliate.

The government considers the move "safe" now that it has set up its own state refining-marketing company to give government-controlled Sahara producers a foothold in France's markets, Minister of Industry Jean-Marcel Jeanneney told deputies of the National Assembly last week.

CFP's purchase of Ozo will create still another outlet for Sahara crude, he said, even though CFP itself is essentially a Middle East producer (primarily in Iraq and Iran).

This is in line with the government policy he voiced earlier: to see the French product market divided about equally between the foreign international majors on one hand and two or more French companies on the other (PW—May6'60,p84).

The two moves were made by the government instead of forcing "national interest" contracts on refiners and distributors in France, the minister said. Under French law, the government could set the quantity and origin of crude refined and sold commercially in the country.

The state company was set up to help solve the delicate problem of marketing Sahara crude "in the face of the world surplus and the prospect of cut-rate Soviet offerings," Jeanneney told the deputies.

He described the company, Union Generale des Petroles, as a holding company open to all French producers that have no refining and marketing facilities of their own.

Now that the company has bought a 60% interest in Caltex facilities in France, the government has decided it will also buy up French independents to build up its refining and marketing organization further.

At present, French companies hold a total of about 42% of the inland civilian market.

The other 58% is held by a half-dozen international majors—counting Caltex.

The $24.5-million Caltex will get for the facilities it's selling will be paid for out of the profits of the Sahara producers that are involved in UGP.

About $8,850,000 of it will be paid off this year, and the balance spread out over subsequent years.

Venezuela Warns Cuba on Its Threat To Three Refiners

CARACAS—Venezuela's Oil Minister last week called for a reconciliation between the Cuban government and the three majors that refine Venezuelan crude in Cuba.

Dr. Juan Perez Alfonzo issued an eight-page statement as a Cuban threat of confiscation hung heavily over Esso, Shell, and Texaco refineries there for their refusal to refine Soviet oil that would displace their own crude imports from Venezuela. He also said that Venezuela does not plan official representations to Cuba which, he added, would be "a form of intervention."

"Our interest is clear in not losing a natural market" in a sister country, Venezuela's Perez Alfonzo said.

Cuba, a "magnificient client," is eighth in rank as an outlet for Venezuelan oil, taking 3.19% of Venezuela's total oil exports.

Perez warned Cuba that it may have difficulty in getting oil from Venezuela in the future if it cuts purchases of Venezuelan crude now.

Referring to friendly countries that are Venezuela's oil customers, Perez said: "Those who in any form—due to given circumstances—decide to diminish their purchases of petroleum from Venezuela must take into account the principles of our policy of economic defense.

"In possible future circumstances which may require a greater production and supply on the part of Venezuela—as was made known to the United Kingdom—whatever prorationing that may be necessary will take into consideration the levels of permanent consumption."

"Venezuela must defend its prices and markets," the minister explained, "since all Venezuelans are dependent on this defense."

Venezuela lives on petroleum, he said. It accounts for 92% of the value of its exports. And the value of total exports is equivalent to one-third of its gross national product.

The minister also implied a warning to Britain on possible displacement of Venezuelan by Russan oil.

"It is our desire," he said, "that present negotiations between the United Kingdom and the Soviet Union should not result in a reduction of the petroleum market we have there."

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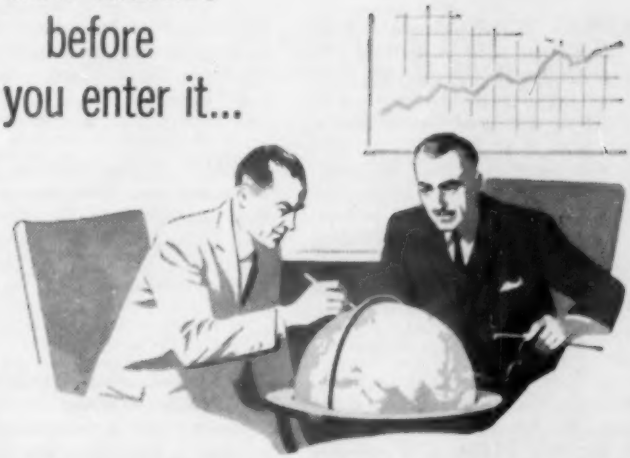

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What's New / AROUND THE WORLD

NEUTRAL ZONE—Japan's Arabian Oil Co. brought in its third offshore producer in the Persian Gulf last week. A Tokyo spokesman said No. 3 Khafji was producing at a rate of more than 6,300 b/d.

He also confirmed that the company is discussing possibilities of building refineries in Japan in partnership with various groups, including Mitsui and Mitsubishi. The former is associated with Standard-Vacuum, and the latter is a partner of Tidewater.

•

INDIA—The Rumanians went abroad—to Britain—to buy equipment for the 15,000 b/d refinery they are building for the Indian government in Assam. Shipments to India of $840,000 worth of instrumentation and control equipment are being started, Elliott-Automation, Ltd., announced in London last week.

•

NORWAY—American Overseas Petroleum, like Shell, is starting a geological survey in the Spitsbergen Archipelago. Two helicopters will be used in the mountainous, snowy island group by Amoseas, a Caltex associate.

•

SPAIN—A bid to build a refinery will soon be filed by a partnership composed of Richfield, Cities Service, and Campsa, Spanish government oil marketing monopoly.

Campsa is expected to hold the largest share in the project, planned for Bilbao, in northern Spain.

•

TURKEY—New hope has been given to oil exploration in Thrace by gas and oil shows in a Shell-Deilmann wildcat, No. 1 Kuleli, which flowed irregularly at 8,850 ft. Further testing is under way.

•

BRAZIL—Brazil has agreed to take delivery of 600,000 tons of Soviet crude plus 100,000 tons of diesel oil in the 12 months starting in July. Brazil had rejected some samples of Russian crude as too high in sulfur content, but the deal was finally worked out under a three-year, $50-million, two-way trade pact on which agreement in principle was reached last December.

•

ITALY—Cities Service and Pan American are selecting a site for their second joint wildcat in southern Italy. The first, No. 1 Cerignola, was abandoned at 1,535 ft. because of drilling difficulties.

•

SYRIA—Deutsche Erdoel's Concordia has confirmed its Sweidia oil discovery with a second well, its seventh test in northeastern Syria. The government announced that No. 2 Sweidia was tested at the rate of 27 tons daily from a 750-ft. pay zone topped at 5,345 ft. No. 1 Sweidia, brought in last year, tested 80 tons daily from 5,615 ft.

•

ALGERIA—Varel Manufacturing Co., Dallas, first American oil equipment maker to get Algerian manufacturing rights, is building a plant at Rouiba, 30 mi. east of Algiers, to make rock bits and other products. The plant is expected to be in operation by October.

•

BRAZIL—The last of six new tankers has been delivered to Petrobras. The 34,000-ton President Deodoro, built in Japan, brings its tanker fleet to a total of 234,000 deadweight tons.

•

SAUDI ARABIA—Aramco is adding at least 200,000 b/d to its 450,000 b/d export capacity for stabilized crude from Abqaiq. It is now completing a 17½-mi. pipeline to Ras Tanura. Diameter of the line is 34 to 36 in., biggest in Saudi Arabia.

•

JAPAN—A $27-million petrochemical plant has been proposed by a Stanvac affiliate, Toa Nenryo. The plant would be built by January, 1962, at Kawasai, if the government approves the venture.

BRAZIL—Sale of California Standard's asphalt blending plant to Petrobras was approved by stockholders of Asfaltos California S.A. (PW—Jan. 29'60,p37). The company had been buying asphalt for blending from the Petrobras Cubatao refinery. Now, blended asphalt will be distributed by California Standard, a major crude supplier to Petrobras.

•

SPAIN—Hoechst, a German firm, has been asked by INI, Spanish government agency, to join in a petrochemical plant proposed for Puertollano, in northern Spain.

The $70-million proposal is in competition with separate bids made by Esso and Shell, both with Spanish partners.

•

SPAIN—Sipsa, Spanish independent, has filed for new acreage, a 33,919-acre tract in northeastern Spain, adjacent to its Montserrat tract.

•

VENEZUELA — Oil output was pushed up nearly 200,000 b/d in May, but the five-month average was 6% below the same period last year.

Output totaled 2.9-million b/d in May, with Creole accounting for more than half the month's gain. Increases were shown by all operators except Texaco, Signal, and Superior. The government's official statistics (in 000 b/d):

Company*	May '60	5-Mos. Avg. '60	5-Mos. Avg. '59
Creole	1,129.0	1,088.7	1,165.5
Shell	771.7	758.3	884.3
Mene Grande	409.1	423.9	367.6
Mobil	132.2	122.7	116.6
Sun	88.7	74.8	30.9
Richmond	66.7	57.1	51.7
Phillips	58.7	56.2	10.0
Texaco	54.9	56.9	51.2
Sinclair	48.6	47.4	53.0
San Jacinto	39.7	41.7	28.4
Atlantic	27.3	25.3	25.6
Signal	21.8	27.7	21.3
Superior	18.3	26.1	20.0
Mercedes	16.8	16.9	31.2
Caracas	11.0	8.4	0.1
Coro	9.6	8.4	0.1
Talon	1.0	1.0	1.4
Totals	2,905.1	2,841.5	2,858.9

**For joint ventures, total group production is listed under operator's name.*

•

SWITZERLAND—British Petroleum has spudded the first of two wildcats in the canton of Fribourg, No. 1 Courtion, under an agreement with Soc. d'Interets Miniers S.A.

C. B. Round

J. E. Finley

CLARENCE B. ROUND has been promoted to manager of manufacturing, and **JAMES E. FINLEY** has been named manager of exploration, for Continental Oil Co.'s Rocky Mountain region, with offices in Denver. Round succeeds **W. F. Brown**, who recently transferred to the company's executive offices in Houston, as special assistant to the senior vice-president. Round has been assistant superintendent of Conoco's Ponca City (Okla.) refinery since 1954. Finley, with Conoco since 1948, was most recently southwestern region exploration manager, at Ft. Worth. **John M. Crawford** and **Dr. Warren L. Jensen** have been promoted to the newly created positions of assistant managers of Conoco's research and development department, at Ponca City. Crawford will be responsible for the production, exploration, and central research divisions, and Jensen will supervise the activities of the petrochemical research, petroleum products, and research services divisions. Crawford was formerly director of exploration research, and Jensen was director of petrochemical research. **W. E. N. Doty**, formerly supervising research geophysicist at Tulsa, succeeds Crawford. **James C. Kirk**, who has been director of research for Petroleum Chemicals, Inc., a Conoco affiliate in Lake Charles, La., succeeds Jensen.

H. M. ERSKINE, H. E. JACKSON, JOHN M. STARKE, and **O. W. CLARK**, vice-presidents of Southern Natural Gas Co., have been promoted to the newly created position of senior vice-president. At the same time, **William S. Tarver, L. N. Brown, Robert G. Kenan,** and **Mortimer Jordan** were elected vice-presidents, and **Howard Maxton** was elected assistant treasurer. Erskine continues as financial vice-president, and Jackson continues as treasurer. Starke will remain in charge of the oil and gas supply division, and Clark will continue to supervise operations and engineering. Tarver is also general attorney and secretary; Brown chief engineer; Kenan director of industrial relations and insurance; and Jordan director of public relations and industrial development.

KARNEY R. COCHRAN, Bradley Production Corp., Wellsville, N. Y., has been elected first vice-president of the Pennsylvania Grade Crude Oil Assn., succeeding **G. J. Hanks**, Oil City, Pa., who has resigned from that position, but continues as a director. Cochran was formerly second vice-president of the association. **A. C. Simmons**, Bradford, Pa., was elected second vice-president, and **John W. Bryner**, E. E. Bryner & Co., Bradford, was elected a director.

C. D. READ has joined Gulf Eastern Co., Gulf Oil Corp. subsidiary in Europe, as manager of its manufacturing department. Read, formerly an economist in the parent company's planning and economics department, has been on special assignment which required him to travel to the Far East, Middle East, and Europe. In his new position, he will be responsible for Gulf's manufacturing and product supply activities in Western Europe, the United Kingdom, and other assigned areas in the Eastern Hemisphere, from headquarters in London. He succeeds **Harry W. Magee**, who has been named special representative in Europe for the parent company's petrochemicals department.

G. T. Piercy

C. J. Hedlund

GEORGE T. PIERCY is the new manager of the coordination and petroleum economics department of Standard Oil Co. (N.J.), in New York, succeeding **CHARLES J. HEDLUND**, who becomes vice-president and a director of Esso Standard Italiana, with headquarters in Genoa. Piercy has been assistant manager of that department since 1958. **Alessandro Zatti**, who has been a director of Esso Italiana for several years, also becomes a vice-president of that company. **R. T. Bonn**, presently with Esso Export Corp., will become a director of the Italian company, succeeding **E. G. Broming**, who will transfer to Jersey Standard. **L. Pittaluga**, assistant comptroller for Esso Italiana, becomes comptroller. He replaces **D. J. Thompson**, who has resigned to become a director of Esso Switzerland.

CHARLES H. BURKHARDT, secretary-treasurer of the Oil Heat Institute of America and national secretary of its distribution division, has also been appointed managing director of the institute. He has been acting managing director since the retirement of **R. H. L. Becker** in April.

FRED W. BATTEN has been elected vice-president and chief operations officer for Columbia Gas System, Inc., New York. He will be responsible for the system's production, transmission, and distribution of natural gas, and the extraction of heavier hydro-carbons from natural gas streams. He was formerly vice-president of Columbia Gas Service Corp. Batten has been with the system since 1936.

GEORGE B. PICHEL moves to Los Angeles as foreign exploration coordinator for Union Oil Co. of California. He was formerly Union's offshore district geologist at Houston.

S. G. OLSON becomes assistant general manager of production for Hudson's Bay Oil & Gas Co., Ltd., Calgary. Olson, formerly superintendent of the company's Calgary district, succeeds **D. Carlton Jones**, who recently was appointed vice-president and general manager of the production department. **E. J. Chaput**, formerly assistant Calgary district superintendent, has been promoted to superintendent, succeeding Olson, and **G. J. Maier**, senior staff engineer, succeeds Chaput.

THEODORE I. GRADIN, assistant director of the American Gas Assn.'s bureau of statistics for the past two years, moves up to director of the bureau. He succeeds **Daniel Parson**, who has joined Northern Illinois Gas Co. as manager of rate and economic research. Gradin, with AGA since 1945, was formerly responsible for gas utility and pipeline analyses.

R. J. (Dick) BOUSHKA is the new general sales manager of Vickers Petroleum Co.'s chemicals division, with headquarters in Wichita, Kan. He succeeds **Dewey Mark**, who has resigned. Boushka, with Vickers since 1955, was most recently sales coordinator for benzene, toluene, and xylene products manufactured at the company's petrochemicals complex at Potwin, Kan.

GERALD A. BURTON is the new exploration manager for Shell Oil Co.'s Pacific Coast area, with offices in Los Angeles. He succeeds **Leo F. Newfarmer**, who has transfered to Houston. Burton, with Shell since 1938, was formerly area exploration manager at New Orleans.

G. A. Burton

I. C. Anderson

I. C. ANDERSON has been elected vice-president of Creole Petroleum Corp., an affiliate of Standard Oil Co. (N.J.). He succeeds **D. E. Stines**, who recently became assistant to the chairman of Jersey Standard. Anderson will continue as manager of Creole's export sales department, in New York.

E. Moncrief

J. P. Wiseman

ERNEST MONCRIEF has been appointed to the newly created position of vice-president, coordinator of foreign operations and affiliates, for Fluor Corp., Ltd., Los Angeles, and **JAMES P. WISEMAN** succeeds him as vice-president in charge of Fluor's Mid-Continent division, at Houston. Wiseman was formerly president of Fluor Products Co., a subsidiary. Moncrief, with Fluor since 1937, was assigned to the Mid-Continent division in 1948, and has been a vice-president since 1952. Wiseman joined Fluor in 1942, and became vice-president and director of sales in 1947. He was named president of Fluor Corp. of Canada in 1952, and became president of Fluor Products in 1955.

GLEN TABLEMAN has been named manager of sales, and **Paul J. Natho** has been named manager of the newly created market development department, for the W-K-M division of ACF Industries, Inc., at Houston. Tableman, who was formerly manager of the company's London office, will have three district managers reporting to him. **Ross Spencer**, formerly with the market research department, is now manager of the southwest district, and **Gaston T. White**, area supervisor at Lafayette, La., is now manager of the southeast district. **William Giffhorn**, formerly supervisor of sales for North Louisiana and East Texas, was named manager of the Mid-Continent district. Natho will direct the promotion of the company's products, with the assistance of four product managers: **M. J. Conley**, oilfield; **Paul Nerren**, pipeline; **Bart Braznell**, refinery; and **Bob Butler**, industrial. Natho will also direct the company's advertising and sales promotion activity through the present advertising supervisor, **R. D. Hunt.**

HUGH A. YOUNG becomes western engineering consultant for Southwestern Industrial Electronics Co., one of the Dresser Industries. He opened offices last year as a technical marketing consultant in Los Angeles.

CRAIG SMYSER, vice-president of special projects and services for Continental-Emsco Co., Dallas, has also been named general manager of Fibercast Co., which has recently been placed under the supervision of C-E. Both organizations are divisions of Youngstown Sheet & Tube Co.

JOSEPH A. HEINEMAN, JR., has been appointed resident manager of sales for the Tulsa sales office of Jones & Laughlin Steel Corp. He has been a salesman in the Tulsa office since 1951.

J. A. Heineman, Jr.

B. L. Berry

BEN L. BERRY assumes the newly created position of domestic sales manager for Tuboscope Co., in Houston. He was formerly southeast zone manager, in New Iberia, La. In his new position, Berry will be in charge of sales in the United States, and will serve as an assistant to the marketing manager.

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RAYMOND E. MORTON has been named to represent Larkin & Co., Butler, Pa., in southeastern Kansas and northeastern Oklahoma. His office and warehouse will be in Bartlesville, Okla. Morton was associated with Halliburton Oil Well Cementing Co. and Baker Oil Tools, Inc., before joining Larkin.

RAY E. GORMAN has been appointed regional sales manager of the Mid-Continent and Permian Basin areas and the Dallas-Ft. Worth district for the Baash-Ross division of Joy Mfg. Co., with headquarters in Dallas. Gorman was Mid-Continent sales manager and division sales manager for Web Wilson Oil Tool Co., before it merged with Baash-Ross earlier this year.

R. E. Gorman

E. R. Phillips

E. R. PHILLIPS has been named manager of the Rocky Mountain region of Bethlehem Steel Co., Supply Division, with offices in Denver. He has been assistant to the regional manager for the southwestern region since January. Before that he was manager of the Panhandle-Western district, at Amarillo, Tex.

D. A. VAN SCOY is president of Vanguard Engineers, Inc., a new engineering service company in Houston. Other principals in the new company are: **E. E. Eutsler**, vice-president; **G. M. Ford**, chief engineer; **Mrs. Doris Sutton**, secretary-treasurer; and **Lajos Vidakovits**, mechanical engineer. Members of the new company are also associated with F. H. Maloney Co., of which Eutsler is president. The new company will design and develop custom components of rubber, plastics, and metals. Vanguard engineers, working from a Shell Pipe Line Co. concept and under its license, have designed and developed an automated system now offered by Maloney.

E. O. NORTHCUTT, JR., becomes technical service engineer for Catalysts & Chemicals, Inc., with offices in Louisville, Ky. He has been a process engineer for Shamrock Oil & Gas Corp. for the past six years. In his new assignment, Northcutt will specialize in providing technical service for the application of CCI catalysts in the petroleum and chemical industries.

OIL FIELD SALES & SERVICE, S.A., Maracaibo, Venezuela, subsidiary of U. S. Industries, Inc., has been appointed exclusive petroleum industry sales and service representative in Venezuela for Gardner-Denver Co.'s pumps and compressors. Gardner-Denver equipment is stocked at Oil Field Sales & Service's Anaco, Tia Juana, and Maracaibo warehouses. In adoition to the sales and service staff of the Venezuelan company, two Gardner-Denver factory specialists will be available for field service in Venezuela oil fields.

GUY E. LEWIS is the new assistant district engineer, machinery and equipment sales and service, at Ventura, Calif., for the Oil Well Supply Division of U. S. Steel Corp. Lewis, who joined Oilwell in 1947, was most recently assistant district engineer, machinery and equipment sales, in Los Angeles.

WILLIAM H. FLYNN has been appointed general manager of the electro-technical labs division of Mandrel Industries, Inc., in Houston. He succeeds **E. F. Florian**, who has been given a special assignment with the MEG products division. The electro-technical labs division manufactures and markets electronic geophysical equipment. Flynn has been involved in oil exploration in Houston since 1955.

JAMES F. McKEIGHAN, JR., is the new general sales manager for the special products division of Cameron Iron Works, Inc., with offices in Houston. He was formerly West Coast sales manager for that division.

J. F. McKeighan, Jr.

F. Goin

FORREST GOIN has been promoted to manager of the special products department of the Axelson Division of U.S. Industries, Inc., Los Angeles. He will be responsible for engineering recommendations, calculations, and installations of multiple-zone pumping equipment. He will supervise two-zone specialists, who handle multiple completions exclusively. **Jack Lee Thompson** and **C. C. Call** are new district managers for Axelson's hydraulic department. Thompson will be in charge of sales and service in the Rocky Mountain area, and will have headquarters in Denver. He was formerly located in Casper, Wyo., where **Billie Morris** and **M. F. Moline**, sales and service representatives, continue to handle the hydraulic department operations. Call will be located at Odessa, where he has been a sales engineer.

DON A. SAUNDERS, operations manager at Houston for the Electro-Technical Labs division of Mandrel Industries, Inc., for the past three years, has been appointed Canadian manager, with offices in Calgary. He replaces **T. G. Gilbert**, who returns to Houston for a special assignment.

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Something to Shout About

IN THESE DAYS OF SURPLUS CRUDE, depressed allowables, shut-in wells, and wobbly prices, a really big discovery of additional domestic reserves would probably make more oil men wince than jump with joy.

It would be like three or four extra scoops of ice cream in a dish that's already overloaded and more than a person can handle comfortably or wisely.

Just the idea of trying to find a place for more U.S. crude in glutted domestic markets is enough to give most oil men the whim-whams. Everybody's still looking for oil, of course, but with mixed hopes and feelings about it.

One old timer put it this way recently: It used to be that when we made a good strike, we couldn't wait to send a hallelujah telegram to the production department, and start the celebration. Now-a-days, when we bring in a well, we're almost afraid to let the home office know about it.

Against this kind of a background, last week's revelation of 11.6-billion bbl. of additional reserves by an Interstate Oil Compact Commission study committee should have occasioned wholesale shuddering from coast to coast.

THAT'S NOT THE CASE at all. The committee's findings are encouraging, even exciting, and are as welcome as found money for a variety of reasons.

They give material credit, for the first time, to the technological horizons that the industry has crossed in recent years, and reflect the dynamic persistence of oil men and science in their efforts to widen the vistas of the future, and to provide for a secure tomorrow.

True, the figures could be questioned as pie-in-the-sky projections, for they are based largely on recovery techniques that still need a lot of experimentation and testing. Perhaps there is more hope than fact built into them, but at least they represent some constructive thinking in the right direction.

MORE IMPORTANT, however, is the fact that the oil industry traditionally has been on the ultraconservative side in estimating its proved reserves. This new figure of 89.8-billion bbl. of producible crude that the IOCC study committee came up with almost triples the estimate of proved reserves. It gives better perspective to the domestic picture, and illustrates dramatically that the U.S. oil potential is far better than most people realize.

It's an optimistic outlook. But then, as we've said before, isn't it better to be optimistic than pessimistic?

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